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ABSTRACT

These student and teacher guides are designed for a secondary-level course in natural resources that focuses on renewable and nonrenewable natural resources, methods of protecting the environment, and the various careers and technologies available in the natural resources area. The following topics are covered in the course's 10 units: outdoor safety and first aid, natural resources and conservation, water resource management, land management, air resource management, energy resources, forestry, wildlife management, wildlife habitats, and outdoor recreation. Each unit in the student edition contains some or all of the following: objective sheet, information sheets, student handouts, assignment sheets, and job sheets. Included in the teacher edition are the following: lists of academic and workplace skills and competencies; competency profile; instructional task analysis; table correlating course tasks with related academic and workplace skill groups/skills; equipment and materials list; list of 66 references; and course units. Each unit in the teacher edition contains some or all of the following: suggested activities; answers to assignment sheets and written tests; written test; unit evaluation form; teacher supplements; and transparency masters. (MN)

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Introduction to Natural Resources

Second Edition

Teacher Edition

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Jane Huston

Developed by

The Multistate Academic and Vocational Curriculum Consortium, Inc.

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Introduction to Natural Resources
Second Edition

Teacher Edition

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Foreword

Introduction to Natural Resources, Second Edition, is designed for secondary students who are interested in learning about renewable and nonrenewable natural resources, how we can protect our environment, and the various careers and technologies available in the natural resources area.

When MAVCC began the process for revising *Introduction to Natural Resources* we knew that our customers wanted additional activities that would reinforce academic and workplace skills, particularly teamwork, problem solving, and critical thinking. And, our technical committee wanted more outdoor safety and first-aid skills to be addressed as well as advanced applications for each of the unit topics. As a result, this second edition and our new *Advanced Applications* will provide students with more opportunities to explore the various areas in natural resources and their related careers and technologies and to acquire entry-level skills that are necessary to be successful.

Teachers are encouraged to read the suggested activities section for each unit of instruction and to make the arrangements for those activities they plan to include as part of their instruction. These materials are designed so that teachers may localize/personalize/supplement the units to fit class interests and to meet new and emerging natural resource issues.

Special attention should be given to the matrix identifying basic academic and workplace skills being reinforced in these instructional materials as well as the teaching suggestions on ways to reinforce these skills.

A chart which classifies and defines each of the academic and workplace skills and competencies has been included in the teacher edition and reflects key elements from *What Work Requires of Schools: A SCANS Report for America 2000*, a 1991 study by the U.S. Department of Labor; *Workplace Basics: The Skills Employers Want*, a three-year study conducted jointly by the American Society for Training and Development (ASTD) and the United States Department of Labor (DOL); and other national and state sources. These tools have been provided in an effort to help educators identify and document where basic academic and workplace skills are being taught. By reinforcing these skills, the teacher should assist students in improving their employability skills.

The success of this publication is due to: (1) teacher response that has helped place the MAVCC format in the forefront of competency-based instructional materials and (2) the technical writers, committee representatives, and production staff who worked on its development.

As you use these instructional materials, we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improvement of the materials, please call or write us.

Dr. Harley Schlichting, Chairman
Board of Directors
Multistate Academic and Vocational
Curriculum Consortium

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The committee which reviewed and revised the first edition and planned the advanced applications supplement includes:

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Use of Introductory Materials

Introductory materials are included in the teacher edition only and contain useful information to assist administrators and teachers in planning for instruction.

In addition to the general information such as the table of contents, foreword, and acknowledgements page, information is included on the following:

1. **Use of this publication**—Explains the components of a unit of instruction and how they should be used as part of the teaching/ learning process.

2. **Competency profile**—Provides a record of student performance for each task included in a unit of instruction. This becomes a part of the student's permanent records and should be utilized when directing the student toward employment opportunities.

3. **Instructional/task analysis**—Provides a quick review of contents of the publication; identifies cognitive (knowledge) skills and psychomotor (doing) skills addressed in each unit of instruction.

4. **Related academic and workplace skills list**—Classifies unit tasks (assignment sheets and job sheets) according to related academic and workplace skills and competencies being reinforced. Skill areas reflected by skill groups, sub skills, and definitions have been identified using *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want.*

5. **Tools, equipment, and materials list**—Provides a comprehensive list of those items needed to successfully complete the assignment sheets and/or job sheets; assists administrator/teacher in determining program costs.

6. **References**—Provide a comprehensive list of resources used in the development of this publication.

As you use these materials, it is hoped that they will provide useful information to meet a variety of needs.

Use of This Publication

Introduction to Natural Resources, Second Edition, contains ten units of instruction. For the teacher edition, the pages are divided into teacher pages and student pages. These include the following:

Teacher Pages

Suggested Activities
Answers to Assignment Sheets*
Answers to Written Test
Written Test
Unit Evaluation Form
Teacher Supplements*
Transparency Masters*

Student Pages

Objective Sheet
Information Sheet
Student Supplements*
Assignment Sheets*
Job Sheets*

* *Designates components that may not appear in every unit of instruction*

The complete teacher edition consists of both teacher pages (loose-leaf format) and student pages (perfect bound), as well as the introductory pages. Teacher pages provide evaluation tools and suggestions on ways to supplement, localize, personalize, and motivate in order to present a complete teaching/learning process.

The student edition consists of student pages and a glossary of terms. Content focuses on measurable and observable learning outcomes.

A new advanced applications supplement (optional) is designed to align with the ten units of instruction found in this second edition, and it includes additional student supplements, assignment sheets, and job sheets to provide students with an opportunity to enhance their knowledge and experience in the area of natural resources.

MAVCC instructional materials are competency-based, not time-based. Students should be allowed to work until they master each competency.

Units of instruction are designed for use in more than one lesson or class period. Careful study of each unit of instruction by the teacher will help to determine the following:

- Amount of materials that can be covered in each class period
- Skills that must be demonstrated
- Amount of class time needed for teacher demonstrations
- Amount of time needed for student practice and return demonstrations of mastered skills
- Supplementary materials, including print and nonprint media and equipment and supplies, that must be ordered
- Resource people who must be contacted

Teacher Pages

Suggested Activities

The suggested activities assist teachers during the preparation stage of the teaching/learning process by providing an instructional plan, teaching suggestions, and a list of resources. Ways to integrate academic and workplace skills have been included in the teaching suggestions, and skill areas have been noted in bold. The teacher should read the suggested activities before teaching the units. Time should be allowed to obtain supplemental materials, prepare audiovisual materials, and contact outside resources. Duties of the teacher will vary according to the particular unit.

Instructions for evaluating student performance on the job sheets are also included in this component. Teachers should select and discuss with students the rating scale that will be used.

To assist a teacher in obtaining suitable supplemental materials, references used in the development of each unit are listed in this component, along with suggested supplemental resources such as books, posters, pamphlets, videotapes, and computer software.

Assignment and Written Test Answers

These are designed to assist the teacher in evaluation of student performances.

Written Test

This component provides criterion-referenced evaluation of every cognitive objective listed in the unit of instruction. The written test may be duplicated for student use. If objectives have been added, deleted, or modified, appropriate changes should be made on the written test. Tests may be divided into shorter tests covering three or four objectives at a time and given soon after those objectives have been covered. A selection of test items from the units covered may be used for final tests at the end of each term if desired.

Unit Evaluation Form

This sheet provides teachers with a record of each student's performance on a unit of instruction. It includes space for assignment sheet ratings, job sheet ratings, written test scores, and teacher comments. The unit evaluation form may be duplicated.

Teacher Supplements

Teacher supplements are optional materials for the teacher to use. They have three purposes: to provide the teacher with higher level materials to stretch the advanced student, with remedial information or practice to assist the less-advanced student, and with state-of-the-art information in which the teacher may not have background or with information that is not readily available in other books. Some teacher supplements may be duplicated for student use and are marked accordingly.

Transparency Masters

Transparency masters are used to direct the students' attention to the topic of classroom discussion. They may provide illustrations, charts, schematics, or additional information needed to clarify and reinforce objectives included in the unit of instruction.

Use of This Publication

Student Pages

Objective Sheet

Each unit of instruction is based on performance objectives which state the goals for successful completion of the course. These performance objectives are stated in two forms: unit objectives which state the expected performance of each student after completion of the unit of instruction, and specific objectives which state what the student must do to reach the unit objective.

The objectives should be stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Teachers should prepare for each unit by deciding how each objective can best be taught.

Teachers should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the teacher should remember to supply the needed information, assignment and/or job sheets, and written test items.

Information Sheet

The information sheet provides the content essential for meeting the cognitive (knowledge) objectives of the unit. Teachers will find that the information sheet serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective. Students should read the information sheet before the information is discussed in class. Space is provided in margins for students and teachers to add notes that supplement, localize, personalize, or provide information for the teaching of each objective.

Student Supplements

The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students will need in order to complete one or more of the assignment and/or job sheets. Students are not directly tested over the information presented in a supplement; however, their ability to apply this information may be evaluated in the completion of assignment sheets or job sheets.

Assignment Sheets

Assignment sheets provide students with pencil and paper activities that give students the opportunity to make practical application of the knowledge in the information sheet. Criteria are provided to objectively evaluate student performance.

Job Sheets

Job sheets are an important segment of each unit. Job sheets provide potential employers with a picture of the skills being taught during training and the performances that might reasonably be expected from an individual who has had this training.

The job sheets provide criteria to objectively evaluate student performance, a list of required equipment and materials, and a step-by-step procedure for performing a psychomotor skill. The teacher should discuss the equipment and materials available in the classroom, laboratory, or shop and demonstrate the procedure prior to having students practice the procedure. When a student is ready to be evaluated, the teacher should follow instructions for evaluating student performance which may be found in the teacher edition (suggested activities component).

Academic and Workplace Skills and Competencies
(Classifications and Definitions)

Foundation Skills		
Skill Groups	**Sub Skills**	**Definitions**
Basic Skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task.
	Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner.
	Arithmetic/ mathematics	Performing basic computations, applying, estimating and reasoning skills, and solving practical problems using a variety of mathematical techniques.
	Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques.
	Listening	Receiving, interpreting, and responding to oral messages and other cues.
	Speaking	Communicating a thought, idea, or fact orally in a clear, concise manner.
Thinking Skills	Creative thinking	Using imagination to generate new ideas.
	Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative.
	Problem solving	Recognizing and defining problems, devising and implementing plan of action, and tracking and evaluating results.
	Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information.
	Knowing how to learn	Using efficient learning techniques to acquire and apply new knowledge and skills.
	Reasoning	Applying a rule or principle underlying the relationship between two or more objects when solving a problem.
Personal Management Skills	Responsibility	Exerting a high level of effort towards goal attainment, working hard to become excellent at doing tasks by setting high standards, paying attention to details, and displaying a high level of concentration.
	Self-esteem	Developing self-confidence and maintaining a positive view of self.
	Career awareness, development and mobility	Assessing self accurately, setting personal goals, establishing and implementing a plan, and monitoring progress.
	Integrity/honesty	Choosing an ethical course of action when faced with making a decision that may break with personal or societal values and recognizing the impact of violating these beliefs and codes on an organization, self, and others.
	Organizational effectiveness	Adapting to the organization's goals, values, culture, and traditional modes of operation.

Competencies

Competency Groups	Sub Skills	Definitions
Resources	Time	Selecting relevant, goal-related activities, ranking them in order of importance, allocating time, and understanding, preparing, and following schedules.
	Money	Using or preparing budgets, making forecasts, keeping records, and making adjustments to meet objectives.
	Material and facilities	Acquiring, storing, and using materials and space efficiently.
	Human resources	Assessing skills and distributing work accordingly; evaluating performance and providing feedback.
Interpersonal Skills	Teamwork	Working cooperatively with others to reach a common goal.
	Coaching	Helping others learn new skills.
	Leadership	Communicating ideas to justify position; accepting responsibility for others; and encouraging, persuading, convincing, or otherwise motivating an individual or group.
	Negotiation	Resolving conflict between two or more individuals through discussion and compromise.
	Customer service	Working and communicating with customers to satisfy their expectations.
	Cultural diversity	Working well with men and women and with a variety of ethnic, social, or educational backgrounds.
Information	Acquisition and evaluation	Identifying need for data, obtaining it from existing sources or creating it, and evaluating its relevance and accuracy.
	Organization and storage	Organizing, processing, and maintaining written or computerized records and other forms of information in a systematic way.
	Interpretation	Selecting and analyzing information and communicating the results to others.
	Processing	Using computers to acquire, organize, analyze, and communicate information.
Systems	Interrelationships	Knowing how social, organizational, and technological systems work and operate effectively.
	Monitoring	Distinguishing trends, predicting impact of actions on system operations, diagnosing deviations in systems' performance, and correcting malfunctions.
	Modification and design	Making suggestions to modify existing systems to improve products or services, and developing new or alternative systems.
Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies.
	Application	Demonstrating proper procedures for setting up and operating equipment.
	Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies.

Introduction to Natural Resources

Competency Profile

Name: ______________________________

Directions: Evaluate the student using the rating scale below. Write the appropriate number to indicate the degree of competency achieved. The descriptions associated with each of the numbers focuses on a level of student performance for each of the tasks listed. The written test scoreline is provided for optional teacher use. It may not be applicable in all cases.

Option A

Rating scale:
4 - Skilled - Can perform job with no additional training.
3 - Moderately Skilled - Has performed job during training program; limited additional training may be required.
2 - Limited Skill - Has performed job during training program; additional training is required to develop skill.
1 - Unskilled - Is familiar with process, but is unable to perform job.
0 - No Exposure - No information or practice provided during training program; complete training required.
NA - Non-applicable.

Option B

Yes - Can perform with no additional training
No - Is unable to perform satisfactorily

Unit 1: Outdoor Safety and First Aid

______ 1. Analyze scenarios to determine appropriate safety and first-aid procedures.
______ 2. Interpret portable fire extinguisher symbols.
______ 3. Read wind chill index and water survival charts.
______ 4. Demonstrate the Heimlich maneuver for an adult choking victim.
______ 5. Operate a fire extinguisher.
______ 6. Lift a heavy object properly.
______ 7. ______________________________
______ 8. ______________________________

______Written Test Score

Advanced Applications (Optional)

______ 1. Interpret material safety data sheets.
______ 2. Analyze current reports concerning outdoor safety and first aid.

Unit 2: Natural Resources and Conservation

______ 1. Report on a local natural resource problem.
______ 2. Report on a current event affecting natural resources.
______ 3. Identify recycling centers in your area.
______ 4. Identify occupations in natural resources in your area.
______ 5. ______________________________
______ 6. ______________________________

______Written Test Score

Advanced Applications (Optional)

______ 1. Trace route of recyclable products.
______ 2. Complete a class community service project.
______ 3. Analyze current reports concerning natural resources and conservation conflict areas.
______ 4. Build and use a composting site.

Unit 3: Water Resource Management

______ 1. Survey your area to identify water pollution sources.
______ 2. Evaluate your source of drinking water.
______ 3. Calculate water measurements.
______ 4. Calculate the cost of water.
______ 5. ______________________________
______ 6. ______________________________

______Written Test Score

Advanced Applications (Optional)

______ 1. Calculate and draw conclusions from water measurements.
______ 2. Determine ways to reduce home water consumption.
______ 3. Research EPA "Superfund" sites in your state.
______ 4. Analyze current reports concerning water resource management.

Unit 4: Land Management

______ 1. Read a soil test report.
______ 2. Complete a land use planning summary.
______ 3. Read a soil survey map.
______ 4. Read a conservation plan.
______ 5. Take a lawn and garden soil sample.
______ 6. Perform a soil test to determine organic matter.
______ 7. Determine percent of soil particles.
______ 8. ______________________________
______ 9. ______________________________

______Written Test Score

Advanced Applications (Optional)

______ 1. Determine fertilizer composition and rates.
______ 2. Report on GIS/GPS technology and utilization.
______ 3. Determine suitability of a site for a septic system.

Unit 5: Air Resource Management

______ 1. Locate sources of air pollution in your area.
______ 2. Write a report on a global environmental problem related to air quality.
______ 3. Observe particulate matter collected on a petroleum jelly pad.
______ 4. ______________________________
______ 5. ______________________________

______Written Test Score

Competency Profile

Advanced Applications (Optional)

_______ 1. Collect and report results from air monitoring equipment.
_______ 2. Investigate the contribution of methane gas to global warming.
_______ 3. Maintain a weather log for 21 days.
_______ 4. Formulate weather forecasts.
_______ 5. Analyze current reports concerning federal mandates to combat air pollution from auto exhaust.

Unit 6: Energy Resources

_______ 1. Discuss the effects of a Middle East oil embargo.
_______ 2. Compare electricity production from coal and nuclear fuel.
_______ 3. Research and report on using agriculture products as alternative energy resources.
_______ 4. Perform an energy audit of your home.
_______ 5. ____
_______ 6. ____

_______Written Test Score

Advanced Applications (Optional)

_______ 1. Analyze current reports concerning energy resources.
_______ 2. Build and test a solar collector.
_______ 3. Build and operate a methane generator.

Unit 7: Forestry

_______ 1. Identify specific trees.
_______ 2. Determine the age of a tree.
_______ 3. Classify local trees.
_______ 4. Determine uses of wood and wood byproducts.
_______ 5. Solve cord measurement problems.
_______ 6. Plant a bareroot tree.
_______ 7. Measure diameter of a tree.
_______ 8. Measure merchantable height of a tree.
_______ 9. ____
_______10. ____

_______Written Test Score

Advanced Applications (Optional)

_______ 1. Project economic returns from a forestry plot.
_______ 2. Analyze areas of conflict in maintaining forests and urban trees.
_______ 3. Analyze current reports concerning areas of conflict in forestry.

Unit 8: Wildlife Management

______ 1. Explain effects on a food chain when parts are removed.
______ 2. Create a food web.
______ 3. List fish and wildlife in your area.
______ 4. Identify wildlife you see in a certain time span.
______ 5. Compile a profile of a wildlife species.
______ 6. ____
______ 7. ____

______Written Test Score

Advanced Applications (Optional)

______ 1. Investigate game animals, hunting seasons, and bag limits in your area.
______ 2. Develop a wildlife food plot.
______ 3. Develop a wildlife habitat.
______ 4. Make management decisions concerning a deer herd.
______ 5. Analyze current reports concerning wildlife management.

Unit 9: Wildlife Habitats

______ 1. Layout and identify ways to improve a local habitat.
______ 2. Identify ways to improve a wetland habitat.
______ 3. Determine the carrying capacity of a pond.
______ 4. Determine the carrying capacity of a rangeland habitat.
______ 5. ____
______ 6. ____

______Written Test Score

Advanced Applications (Optional)

______ 1. Survey non-game birds at a feeding station.
______ 2. Survey wildlife foods.
______ 3. Survey for wildlife signs.
______ 4. Develop a management plan for a farm pond for sport fishing.
______ 5. Analyze current reports concerning wildlife habitats.
______ 6. Construct nesting sites.
______ 7. Increase hummingbird habitat.

Unit 10: Outdoor Recreation

______ 1. Identify outdoor recreation activities and facilities available locally.
______ 2. Make a presentation about an outdoor recreation activity.
______ 3. Interpret graphs on future trends in outdoor recreation.
______ 4. Evaluate a local outdoor recreation site.
______ 5. Plan and design a new outdoor recreation area.
______ 6. Research local employment opportunities in outdoor recreation.
______ 7. ____
______ 8. ____

______Written Test Score

Competency Profile

Advanced Applications (Optional)

______ 1. Develop a historical presentation for visitors to your area.
______ 2. Evaluate conflict resolution scenarios.
______ 3. Give accurate, easy-to-follow directions.
______ 4. Locate constellations in the night sky.
______ 5. Analyze current reports concerning the growth of outdoor recreation and its effects on the environment.
______ 6. Build a wood-conserving Dakota fire hole.

COMMENTS: ____

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Evaluator: ______________________________ Date: ______________

*** Permission to duplicate this profile is granted.**

Introduction to Natural Resources

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 1: Outdoor Safety and First Aid

1. Terms and definitions
2. Basic first-aid procedures for emergency situations
3. Contents of a basic first-aid kit
4. Types of poisonous snakes
5. Types of poisonous plants
6. Types of poisonous spiders
7. Safety precautions to take in inclement weather
8. Components of the fire triangle
9. Classes of fires and their definitions
10. Types of fire extinguishers and classes of fires they were designed to extinguish
11. Purposes of a material safety data sheet
12. Guidelines for lifting and carrying items safely
13. Analyze scenarios to determine appropriate safety and first-aid procedures
14. Interpret portable fire-extinguisher symbols
15. Read wind chill index and water survival charts
16. Demonstrate the Heimlich maneuver for an adult choking victim
17. Operate a fire extinguisher
18. Lift a heavy object properly

Optional

19. Interpret material safety data sheets
20. Analyze current reports concerning outdoor safety and first aid

Unit 2: Natural Resources and Conservation

1. Terms and definitions
2. Types of natural resources
3. Basic components of the physical environment
4. History of natural resources
5. Importance of natural resources

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 2: Natural Resources and Conservation (cont.)

6. Conflicts in natural resource management
7. Factors which affect natural resources
8. Preservation and conservation of natural resources
9. Preservation activities
10. Conservation activities
11. Categories of solid waste
12. Composition of solid waste in a typical municipal landfill
13. Methods of waste disposal
14. Waste reduction activities
15. Recyclables and nonrecyclables
16. Federal agencies responsible for natural resources
17. Types of occupations in natural resources
18. Getting a job in natural resources
19. Characteristics of a person working in natural resources

20. Report on a local natural resource problem
21. Report on a current event affecting natural resources
22. Identify recycling centers in your area
23. Identify occupations in natural resources in your area

Optional

24. Trace route of recyclable products
25. Complete a class community service project
26. Analyze current reports concerning natural resources and conservation conflict areas
27. Build and use a composting site

Unit 3: Water Resource Management

1. Terms and definitions
2. History of the importance of water in the United States
3. Water distribution
4. Uses of water
5. Hydrologic (water) cycle
6. Surface water

Instructional/Task Analysis

Unit 3: Water Resource Management (cont.)

Related Information: What the Student Should Know

7. Ground water
8. Relationship between ground water and surface water
9. Water pollution
10. Comparison of the environment—1960 and 1995
11. Hazardous/toxic waste
12. Federal legislation for environmental protection of water resources
13. Watersheds
14. Water measurements
15. Career opportunities in water resource management

Application: What the Student Should Be Able to Do

16. Survey your area to identify water pollution sources
17. Evaluate your source of drinking water
18. Calculate water measurements
19. Calculate the cost of water

Optional

20. Calculate and draw conclusions from water measurements
21. Determine ways to reduce home water consumption
22. Research EPA "Superfund" sites in your state
23. Analyze current reports concerning water resource management

Unit 4: Land Management

1. Terms and definitions
2. How soils are formed
3. Types of rocks
4. Weathering factors
5. Ways soils are deposited
6. Major soil texture classes
7. Composition of an average soil
8. Functions of organic matter
9. Horizons of a soil profile
10. Land capability classes

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 4: Land Management (cont.)

Related Information: What the Student Should Know

11. Soil testing
12. Plant nutrients
13. Nutrients in a fertilizer analysis
14. Soil survey reports
15. Types of erosion
16. Causes of erosion
17. Effects of erosion
18. Contributors to erosion pollution
19. Controlling erosion on the farm
20. Methods of controlling urban erosion
21. Stewards of the soil
22. Conservation provisions of the historic 1985 Farm Bill
23. Parts of a conservation plan
24. Reclamation of mined lands
25. Career opportunities in land management

Application: What the Student Should Be Able to Do

26. Read a soil test report
27. Complete a land use planning summary
28. Read a soil survey map
29. Read a conservation plan
30. Take a lawn and garden soil sample
31. Perform a soil test to determine organic matter
32. Determine percent of soil particles

Optional

33. Determine fertilizer composition and rates
34. Report on GIS/GPS technology and utilization
35. Determine suitability of a site for a septic system

Unit 5: Air Resource Management

1. Terms and definitions
2. Composition and percentages of air components (unpolluted)
3. Air pollutants and their characteristics and health hazards
4. Environmental effects of air pollution
5. Indoor air pollution
6. Indoor air pollutants and their characteristics

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 5: Air Resource Management (cont.)

Related Information: What the Student Should Know

7. Air quality regulations
8. Methods of controlling motor vehicle emissions
9. Methods of controlling air pollution
10. Air quality trends in the United States
11. Global considerations in air resource management
12. Career opportunities in air resource management

Application: What the Student Should Be Able to Do

13. Locate sources of air pollution in your area
14. Write a report on a global environmental problem related to air quality
15. Observe particulate matter collected on a petroleum jelly pad

Optional

16. Collect and report results from air monitoring equipment
17. Investigate the contribution of methane gas to global warming
18. Maintain a weather log for 21 days
19. Formulate weather forecasts
20. Analyze current reports concerning federal mandates to combat air pollution from auto exhaust

Unit 6: Energy Resources

1. Terms and definitions
2. Classifications of energy resources
3. Coal energy resources
4. Oil energy resources
5. Natural gas energy resources
6. Nuclear energy resources
7. Hydropower energy resources
8. Biomass energy resources
9. Solar energy resources

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 6: Energy Resources (cont.)

10. Wind energy resources
11. Geothermal energy resources
12. U.S. energy reserves
13. Uses of oil resources in the U.S.
14. Goals of energy conservation
15. Ways to conserve energy
16. Career opportunities in energy resources

17. Discuss the effects of a Middle East oil embargo
18. Compare electricity production from coal and nuclear fuel
19. Research and report on using agriculture products as alternative energy resources
20. Perform an energy audit of your home

Optional

21. Analyze current reports concerning energy resources
22. Build and test a solar collector
23. Build and operate a methane generator

Unit 7: Forestry

1. Terms and definitions
2. Main parts of a tree
3. Parts of the crown
4. Parts of the trunk
5. Types of roots and their functions
6. Ways trees are identified
7. Photosynthesis
8. Growth of a tree
9. Classifications of trees
10. Common uses of trees
11. Benefits of forests to the environment
12. Government agencies involved in forestry
13. Major forest regions of the United States

Instructional/Task Analysis

Unit 7: Forestry (cont.)

Related Information: What the Student Should Know

14. Types of forest cuttings
15. Ways that tree stands regenerate
16. Forest measurements
17. Measuring instruments used in forestry
18. Forest enemies
19. Causes of fire
20. Types of forest fires
21. Categories of forest fires
22. Benefits of controlled burns
23. Career opportunities in forestry

Application: What the Student Should Be Able to Do

24. Identify specific trees
25. Determine the age of a tree
26. Classify local trees
27. Determine uses of wood and wood byproducts
28. Solve cord measurement problems
29. Plant a bareroot tree
30. Measure diameter of a tree
31. Measure merchantable height of a tree

Optional

32. Project economic returns from a forestry plot
33. Analyze areas of conflict in maintaining forests and urban trees
34. Analyze current reports concerning areas of conflict in forestry

Unit 8: Wildlife Management

1. Terms and definitions
2. Food chain
3. Interconnections in a food web
4. Predator/prey relationship
5. History of wildlife in the United States
6. Federal legislation concerning wildlife
7. Major types of birds
8. Common mammals

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 8: Wildlife Management (cont.)

9. Major fish species
10. U.S. endangered species
11. Dangers to wildlife populations
12. Agricultural practices that support wildlife
13. Wildlife activities that may cause damage to agriculture
14. Ways to control wildlife damage problems
15. Public wildlife and private lands
16. Types of wildlife production areas
17. Government agencies involved in wildlife management
18. Career opportunities related to wildlife management

19. Explain effects of a food chain when parts are removed
20. Create a food web
21. List fish and wildlife in your area
22. Identify wildlife you see in a certain time span
23. Compile a profile of a wildlife species

Optional

24. Investigate game animals, hunting seasons, and bag limits in your area
25. Develop a wildlife food plot
26. Develop a wildlife habitat
27. Make management decisions concerning a deer herd
28. Analyze current reports concerning wildlife management

Unit 9: Wildlife Habitats

1. Terms and definitions
2. Components of a habitat
3. Objectives of wildlife habitat management
4. Habitat management principles
5. Common tools and techniques of habitat improvement
6. Actions taken to improve wildlife habitats
7. Causes of habitat destruction
8. Types of wildlife habitats

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 9: Wildlife Habitats (cont.)

Related Information: What the Student Should Know

9. Lakes, ponds, and porthole habitats
10. River and stream habitats
11. Wetland habitats
12. Woodland habitats
13. Rangeland habitats
14. Farmland habitats
15. Urban habitats

Application: What the Student Should Be Able to Do

16. Layout and identify ways to improve a local habitat
17. Identify ways to improve a wetland habitat
18. Determine the carrying capacity of a pond
19. Determine the carrying capacity of a rangeland habitat

Optional

20. Survey non-game birds at a feeding station
21. Survey wildlife foods
22. Survey for wildlife signs
23. Develop a management plan for a farm pond for sport fishing
24. Analyze current reports concerning wildlife habitats
25. Construct nesting sites
26. Increase hummingbird habitat

Unit 10: Outdoor Recreation

1. Terms and definitions
2. Equipment and facilities needed for outdoor recreation activities
3. Skills and licenses needed for outdoor recreation activities
4. Factors increasing the demand and participation in outdoor recreation

Unit 10: Outdoor Recreation (cont.)

Related Information: What the Student Should Know

5. Other factors affecting current and future participation in recreational activities

6. Considerations when selecting an outdoor recreation area

7. Reasons why people participate in outdoor recreation

8. Agencies responsible for public lands, recreation areas, and employment in outdoor recreation

9. Employment opportunities in outdoor recreation.

10. Business opportunities in outdoor recreation

Application: What the Student Should Be Able to Do

11. Identify outdoor recreation activities and facilities available locally

12. Make a presentation about an outdoor recreation activity

13. Interpret graphs on future trends in outdoor recreation

14. Evaluate a local outdoor recreation site

15. Plan and design a new outdoor recreation area

16. Research local employment opportunities in outdoor recreation

Optional

17. Develop a historical presentation for visitors to your area

18. Evaluate conflict resolution scenarios

19. Give accurate, easy-to-follow directions

20. Locate constellations in the night sky

21. Analyze current reports concerning the growth of outdoor recreation and its effects on the environment

22. Build a wood-conserving Dakota Fire Hole

Related Academic and Workplace Skills
For *Introduction to Natural Resources*

Task	Skill Group	Sub Skill	Description
Unit 1: Outdoor Safety and First Aid			
Analyze scenarios to determine appropriate safety and first-aid procedures (A.S. 1)	Foundation Skills	Reading	Follows written directions; draws conclusions from what is read
		Writing	Presents conclusions in a clear, concise manner
	Thinking Skills	Problem solving	Demonstrates logical reasoning in reaching a conclusion
Interpret portable fire-extinguisher symbols (A.S. 2)	Foundation Skills	Reading	Comprehends written information; applies what has been read to a specific task
		Writing	Communicating a fact in written form in a clear, concise manner
Read wind chill index and water survival charts (A.S. 3)	Foundation Skills	Reading	Reads charts to obtain factual information
		Science	Applies scientific principles in a given situation
Demonstrate the Heimlich maneuver for an adult choking victim (J.S. 1)	Foundation Skills	Reading	Comprehends written information; applies what has been read to a specific task
		Science	Applies life-saving technique
Operate a fire extinguisher (J.S. 2)	Foundation Skills	Reading	Comprehends written information; applies what has been read to a specific task
	Technology	Application	Demonstrates proper procedure for operating equipment
Lift a heavy object properly (J.S. 3)	Foundation Skills	Reading	Comprehends written information; applies what has been read to a specific task
Interpret material safety data sheets (A.S. 1A)	Foundation Skills	Reading	Understands/applies technical words that pertain to subject; interprets written information
		Writing	Presents answers in a clear and understandable form
Analyze current reports concerning outdoor safety and first aid (A.S. 2A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas; draws conclusions from what is read
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document

Task	Skill Group	Sub Skill	Description
Unit 2: Natural Resources and Conservation			
Report on a local natural resource problem. (A.S. 1)	Foundation Skills	Reading	Follows written directions; applies information and concepts derived from printed materials
		Writing	Applies rules of grammar, punctuation, capitalization, and spelling; organizes information into an appropriate format; produces neat, legible document
		Science	Analyzes environmental issues
	Thinking Skills	Problem solving	Recognizes problem; identifies reasons for problem; draws conclusions from observations and evaluates conditions and gives possible solution
Report on a current event affecting natural resources. (A.S. 2)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; draws conclusions from what is read
		Speaking	Communicates a thought, idea, or fact in spoken form; speaks in a clear, concise manner
		Science	Analyzes environmental issues
	Thinking Skills	Problem solving	Recognizes problem; draws conclusions from what is read and gives possible solutions
Identify recycling centers in your area. (A.S. 3)	Foundation Skills	Reading	Uses written resources to obtain factual information; determines what information is needed
		Writing	Records information accurately; writes/prints legibly
Identify occupations in natural resources in your area. (A.S. 4)	Foundation Skills	Reading	Follows written directions; determines what information is needed; uses written resources to obtain factual information
		Writing	Writes logical and understandable sentences; writes/prints legibly
	Thinking Skills	Decision making	Evaluates information to make best decision
	Personal Management Skills	Career awareness	Explores career opportunities
Trace route of recyclable products (A.S. 1A)	Foundation Skills	Reading	Follows written directions; adjusts reading strategy to purpose and type of reading; determines what information is needed
		Writing	Presents answers in a clear and understandable form; applies rules of grammar, punctuation, capitalization, and spelling; organizes information into an appropriate format; produces neat, legible document
		Science	Analyzes environmental issues—waste management

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 2: (continued)			
	Thinking Skills	Problem solving	Draws conclusions from what is read and spoken
	Interpersonal Skills	Teamwork	Works effectively with others to reach a common goal
	Information	Acquisition and evaluation	Acquires/evaluates information for relevance and accuracy
Complete a class community service project. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; uses written resources
		Writing	Keeps project records; applies rules of grammar, punctuation, capitalization, and spelling; organizes information into an appropriate format; produces neat, legible document
		Science	Applies environmental principles to accomplish a task
	Thinking Skills	Creative thinking	Identifies new goals and objectives
	Resources	Human resources	Assesses each worker's skills and distributes work accordingly
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort
Analyze current reports concerning natural resources and conservation conflict areas. (A.S. 3A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas; draws conclusions from what is read
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues
Build a composting site. (J.S. 1A)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; uses appropriate materials and techniques as specified
		Writing	Uses language, style, organization, and format appropriate to subject matter, purpose, and audience; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Applies scientific knowledge to complete a practical task
		Listening	Listens for content

Unit 2: (continued)

Task	Skill Group	Sub Skill	Description
		Speaking	Participates in group discussion; speaks in a clear, concise manner
	Resources	Material and facilities	Obtains equipment and materials to accomplish objectives; demonstrates safe use of tools and equipment
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort

Unit 3: Water Resource Management

Task	Skill Group	Sub Skill	Description
Survey your area to identify water pollution sources. (A.S. 1)	Foundation Skills	Reading	Follows written directions; uses written resources
		Writing	Presents conclusions in a clear and understandable form; writes/prints legibly
		Science	Applies scientific knowledge to complete a task
		Listening	Listens for content
		Speaking	Asks questions to obtain/clarify information
	Thinking Skills	Problem solving	Demonstrates logical reasoning in reaching a conclusion
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort
	Information	Interpretation	Selects and analyzes information from a variety or sources; communicates results to others
Evaluate your source of drinking water. (A.S. 2)	Foundation Skills	Reading	Determines what information is needed
		Writing	Presents answers in a clear and understandable form; writes/prints legibly
		Science	Analyzes environmental issues—water pollution
		Listening	Listens for content
	Thinking Skills	Reasoning	Evaluates conditions and draws conclusions from available information
	Information	Acquisition and evaluation	Acquires information from existing source
Calculate water measurements. (A.S. 3)	Foundation Skills	Reading	Follows written directions
		Math	Applies a mathematical formula to solve a problem
Calculate the cost of water. (A.S. 4)	Foundation Skills	Reading	Follows written directions; identifies relevant information to solve a problem
		Math	Applies computation skills to determine cost

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 3: (continued)			
Calculate and draw conclusions from water measurements. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; identifies relevant information to solve a problem
		Math	Applies computation skills to determine water flow and volume
	Thinking Skills	Reasoning	Uses logic to draw conclusions from available information
Determine ways to reduce home water consumption. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task
		Writing	Presents answers in a clear and understandable form; writes/prints legibly
	Thinking Skills	Reasoning	Uses logic to draw conclusions from available information
		Creative thinking	Finds new ways of dealing with existing problem
Research EPA "Superfund" sites in your state. (A.S. 3A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; determines what information is needed; draws conclusions from what is read
		Writing	Uses technical words and concepts; uses language, style, organization, and format appropriate to subject matter, purpose, and audience; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
	Thinking Skills	Creative thinking	Forms opinions; prepares document based on research
		Problem solving	Recognizes/defines problem
	Information	Acquisition and evaluation	Obtains data and evaluates its relevance and accuracy
Analyze current reports concerning water resource management. (A.S. 4A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas; draws conclusions from what is read
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues

Task	Skill Group	Sub Skill	Description
Unit 4: Land Management			
Read a soil test report. (A.S. 1)	Foundation Skills	Reading	Follows written directions; identifies relevant details, facts, and specifications
		Writing	Records neat, legible answers
		Science	Reads laboratory test results
Complete a land use planning summary. (A.S. 2)	Foundation Skills	Reading	Follows written directions; determines what information is needed
		Writing	Records neat legible answers
Read a soil survey map. (A.S. 3)	Foundation Skills	Reading	Follows written directions; identifies relevant details, facts, and specifications
		Writing	Records neat, legible answers
		Science	Applies scientific knowledge
Read a conservation plan. (A.S. 4)	Foundation Skills	Reading	Follows written directions; identifies relevant details, facts, and specifications
		Writing	Records neat, legible answers
		Science	Utilizes scientific data
Take a lawn and garden soil sample. (J.S. 1)	Foundation Skills	Reading	Follows written directions; comprehends written information; applies information to job performance
		Writing	Completes form accurately; writes/prints legibly
		Math	Makes rough measurements
		Science	Uses laboratory equipment; performs experiment as specified
	Resources	Materials and facilities	Demonstrates safe use of tools and equipment
Perform a soil test to determine organic matter. (J.S. 2)	Foundation Skills	Reading	Follows written directions; comprehends written information; applies information to job performance
		Science	Uses laboratory equipment; performs experiment as specified
	Thinking Skills	Problem solving	Draws conclusions from observation
Determine percent of soil particles. (J.S. 3)	Foundation Skills	Reading	Follows written directions; comprehends written information; applies information to job performance
		Math	Makes rough measurements; estimates percentages
		Science	Performs experiment as specified; applies scientific principles—soil types

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 4: (continued)			
Determine fertilizer composition and rates. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; comprehends written information
		Math	Calculates percentages and different units of measurement; applies basic computation skills as they are used on job
		Science	Applies scientific principles—chemical compounds
	Thinking Skills	Decision making	Evaluates information to make best decision
Report on GIS/GPS technology and utilization. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas; draws conclusions from what is read
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues
	Thinking Skills	Reasoning	Uses logic to draw conclusions from available information
Determine suitability of a site for a septic system. (J.S. 1A)	Foundation Skills	Reading	Follows written directions; comprehends written information; applies information to job performance
		Writing	Records data through observation; analyzes data, summarizes results, and makes conclusions in lab report
		Math	Takes measurements using a yardstick
		Science	Performs experiment as specified; applies scientific principles—soil types
Unit 5: Air Resource Management			
Locate sources of air pollution in your area. (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Writing	Records data through surveying
		Science	Analyzes environmental issues—air pollution
		Listening	Listens for content
		Speaking	Asks questions to obtain and clarify information; participates in discussion and group presentation
	Thinking Skills	Creative thinking	Forms opinions; prepares presentation based on subject research and surveys
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort

Task	Skill Group	Sub Skill	Description
Unit 5: (continued)			
Write a report on a global environmental problem related to air quality. (A.S. 2)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; draws conclusions from what is read
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
Observe particulate matter collected on a petroleum jelly pad. (A.S. 3)	Foundation Skills	Reading	Follows written directions
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Performs experiment as specified; records scientific data from observations
Collect and report results from air monitoring equipment. (A.S. 1A)	Foundation Skills	Reading	Follows written directions
		Writing	Applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Describes procedure for testing air quality; acquires and processes scientific data—test results
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on observation and interpretation
Investigate the contribution of methane gas to global warming. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; draws conclusions from what is read
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—air pollution
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
Maintain a weather log for 21 days. (A.S. 3A)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Writing	Records data through observation; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Applies scientific principles to observe and predict weather
		Listening	Listens for content

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 5: (continued)			
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research and observation
	Information	Interpretation	Analyzes information and communicates results to others
	Technology	Selection	Chooses proper equipment to access weather information
Formulate weather forecasts. (A.S. 4A)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; uses weather maps to obtain factual information
		Writing	Records data through observation
		Math	Takes and compares measurements using common device—barometer
		Science	Monitors variables—wind direction, barometer readings; monitors weather broadcasts to collect data; reads and interprets weather maps; applies scientific principles to predict weather
		Listening	Listening for content
		Speaking	Organizes ideas and communicates oral messages to listeners; speaks in a clear, concise manner
	Thinking Skills	Creative thinking	Forms opinions; prepares presentation based on research and observation
	Information	Interpretation	Analyzes information and communicates results to others
	Technology	Selection	Chooses proper equipment to access weather information
Analyze current reports concerning federal mandates to combat air pollution from auto exhaust. (A.S. 5A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas.
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—air pollution
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
		Decision making	Identifies pros and cons to assist in decision making; evaluates information to make best decision
		Problem solving	Recognizes/defines problem; draws conclusions from what is read; demonstrates logical reasoning in reaching a conclusion

Task	Skill Group	Sub Skill	Description
Unit 6: Energy Resources			
Discuss the effects of a Middle East oil embargo. (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner
		Listening	Listens for content
		Speaking	Participates in group discussion
	Thinking Skills	Problem solving	Recognizes problem; demonstrates logical reasoning in reaching a conclusion
Compare electricity production from coal and nuclear fuels. (A.S. 2)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents
		Writing	Presents conclusions in a clear and understandable form; writes/prints legibly
	Thinking Skills	Decision making	Identifies pros and cons to assist in decision making process
		Reasoning	Uses logic to draw conclusions from available information
		Creative thinking	Combines personal opinion with ideas or information to address existing problem
Research and report on using agricultural products as alternative energy resources. (A.S. 3)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—energy resources
	Thinking Skills	Creative thinking	Form opinions; prepares report based on subject research
		Problem solving	Draws conclusions from what is read; demonstrates logical reasoning in reaching a conclusion
Perform an energy audit of your home. (A.S. 4)	Foundation Skills	Reading	Follows written directions; determines what information is needed
		Writing	Applies/uses technical words and concepts; records data through observation; writes/prints legibly
	Thinking Skills	Problem solving	Recognizes/defines problems; draws conclusions from observations and evaluates conditions and gives possible solutions

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 6: (continued)			
	Resources	Facilities	Maintains facility for optimum energy efficiency and productivity
	Information	Acquisition and evaluation	Collects information and evaluates its relevance
	Systems	Monitoring	Evaluates performance and corrects problems
Analyze current reports concerning energy resources. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—energy resources
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
		Decision making	Identifies pros and cons to assist in decision making; evaluates information to make best decision
		Problem solving	Recognizes/defines problem; demonstrates logical reasoning in reaching a conclusion
Build and test a solar collector. (J.S. 1A)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; uses appropriate materials and techniques as specified
		Writing	Uses language, style, organization, and format appropriate to subject matter; applies rues of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Applies scientific knowledge to complete a task; compares air temperatures
		Listening	Listens for content
		Speaking	Participates in group discussion; speaks in a clear, concise manner
	Thinking Skills	Creative thinking	Uses imagination to select appropriate building materials
	Resources	Material and facilities	Obtains equipment and materials to accomplish task; demonstrates safe use of equipment
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort

Task	Skill Group	Sub Skill	Description
Unit 6: (continued)			
Build and operate a methane generator. (J.S. 2A)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; uses appropriate materials and techniques as specified
		Writing	Uses language, style, organization, and format appropriate to subject matter; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Uses laboratory equipment and techniques; performs experiment as specified observing safety precautions
		Listening	Listens for content
		Speaking	Participates in group discussion; speaks in a clear, concise manner
	Resources	Material and facilities	Obtain equipment and materials to accomplish task; demonstrates safe use of equipment
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort
Unit 7: Forestry			
Identify specific trees. (A.S. 1)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain needed information
		Writing	Writes/prints legibly
		Science	Collects and identifies leaf samples
Determine the age of a tree. (A.S. 2)	Foundation Skills	Reading	Follows written directions
		Math	Performs basic computation—addition
		Science	Applies a scientific principle to solve a problem
Classify local trees. (A.S. 3)	Foundation Skills	Reading	Follows written directions
		Writing	Writes appropriate entries; writes/prints legibly
		Science	Applies scientific knowledge to complete a task
Determine uses of wood and wood by-products. (A S. 4)	Foundation Skills	Reading	Follows written directions; draws conclusions from what is read
		Writing	Writes appropriate entries; writes/prints legibly
		Science	Applies scientific knowledge to complete a task
Solve cord measurement problems. (A.S. 5)	Foundation Skills	Math	Calculates measurements—proportions and percentages

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 7: (continued)			
Plant a bareroot tree. (J.S. 1)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task; uses appropriate materials and techniques as specified
		Science	Applies a scientific technique to complete a task; demonstrates understanding of organic matter
		Listening	Listens for content
		Speaking	Participates in group discussion; speaks in a clear, concise manner
	Resources	Material and facilities	Obtains equipment and materials to accomplish task; demonstrates safe use of equipment
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort
Measure diameter of a tree. (J.S. 2)	Foundation Skills	Reading	Follows written directions; uses appropriate materials and techniques as specified
		Math	Makes precision measurements using measuring tapes
	Resources	Material and facilities	Obtains equipment and materials to accomplish task; demonstrates safe use of equipment
Measure merchantable height of a tree. (J.S. 3)	Foundation Skills	Reading	Follows written directions; uses appropriate materials and techniques as specified
		Math	Makes precision measurement using measuring tape
	Resources	Material and facilities	Obtains equipment and materials to accomplish task; demonstrates safe use of equipment
Project economic returns from a forestry plot. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; determines what information is needed
		Writing	Uses language, style, organization, and format appropriate to subject matter; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Math	Calculates cost and profit estimates
		Listening	Listens for content
		Speaking	Asks questions to obtain and clarify information
	Thinking Skills	Decision making	Considers risks and evaluates and chooses the best alternative
	Personal Management Skills	Career awareness	Explores and evaluates career opportunity

Task	Skill Group	Sub Skill	Description
Unit 7: (continued)			
Analyze areas of conflict in maintaining forests and urban trees. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; draws conclusions from what is read
		Writing	Presents conclusions in a clear and understandable form; writes/prints legibly
	Thinking Skills	Decision making	Evaluates information to make best decision
		Problem solving	Demonstrates logical reasoning in reaching a conclusion
Analyze current reports concerning areas of conflict in forestry. (A.S. 3A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—forest management
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
		Decision making	Identifies pros and cons to assist in decision making; evaluates information to make best decision
		Problem solving	Recognizes/defines problem; demonstrates logical reasoning in reaching a conclusion
Unit 8: Wildlife Management			
Explain effects on a food chain when parts are removed. (A.S. 1)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Writing	Presents answers in a clear and understandable form; writes/prints legibly
		Science	Applies principles and concepts of biology
	Thinking Skills	Reasoning	Sees relationship between two or more objects/situations and considers possible effects on each
Create a food web (A.S. 2)	Foundation Skills	Reading	Follows written directions; uses written resources
		Writing	Writes/prints legibly
		Science	Constructs model to depict basic concept of food web
	Thinking Skills	Creative thinking	Creates a visual aid based on subject knowledge

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 8: (continued)			
List fish and wildlife in your area. (A.S. 3)	Foundation Skills	Reading	Follows written directions
		Writing	Writes/prints legibly
		Science	Applies principles and concepts of biology
Identify wildlife you see in a certain time span. (A.S. 4)	Foundation Skills	Reading	Follows written directions
		Writing	Writes/prints legibly
		Science	Applies knowledge of wildlife species
Compile a profile of a wildlife species. (A.S. 5)	Foundation Skills	Reading	Follows written directions; uses written resources; determines what information is needed; comprehends written information for main ideas
		Writing	Organizes information into an appropriate format; applies rules of grammar, punctuation, capitalization, and spelling; uses technical words correctly; produces neat, legible document
		Science	Applies scientific principles and concepts of biology
		Listening	Listens for content
		Speaking	Speaks in a clear, concise manner
	Thinking Skills	Creative thinking	Combines ideas or information in a new way; prepares presentation based on subject research
	Information	Acquisition and evaluation	Acquires information from existing sources
		Processing	Uses computers to acquire and organize information
Investigate game animals, hunting seasons, and bag limits in your area. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Writing	Completes form accurately; writes/prints legibly
Develop a wildlife food plot. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information and applies it to a task
		Science	Solves practical problems using scientific techniques
		Listening	Listening for content
		Speaking	Asks questions to obtain/clarify information

Task	Skill Group	Sub Skill	Description
Unit 8: (continued)			
	Thinking Skills	Problem solving	Devises and implements a plan of action to resolve a problem; tracks and evaluates results
	Resources	Material and facilities	Obtains and uses materials correctly
Develop a wildlife habitat. (A.S. 3A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information and applies it to a task
		Writing	Organizes information into an appropriate format; applies rules of grammar, punctuation, capitalization, and spelling; uses technical words; produces neat, legible document
		Science	Solves practical problems using scientific techniques
		Listening	Listening for content
		Speaking	Asks questions to obtain/clarify information
	Thinking Skills	Problem solving	Devises and implements a plan of action to resolve a problem; tracks and evaluates results
	Resources	Material and facilities	Obtains and uses materials correctly
Make management decisions concerning a deer herd. (A.S. 4A)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Writing	Completes form accurately; writes/prints legibly
		Math	Applies computation skills as they are used on job; constructs budget
		Science	Applies principles and concepts of biology
		Listening	Listening for content
		Speaking	Asks questions to obtain/clarify information
	Thinking Skills	Problem solving	Devises and implements a plan of action to resolve a problem
	Interpersonal Skills	Teamwork	Works effectively with others to reach a common goal
Analyze current reports concerning wildlife management. (A.S. 5A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—wildlife management

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 8: (continued)			
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
		Decision making	Identifies pros and cons to assist in decision making; evaluates information to make best decision
		Problem solving	Demonstrates logical reasoning in reaching a conclusion
Unit 9: Wildlife Habitats			
Layout and identify ways to improve a local habitat. (A.S. 1)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; recalls important details from written information
		Science	Applies principles and concepts of biology
	Thinking Skills	Creative thinking	Combines ideas or information to create a new way of dealing with existing problem
		Problem solving	Demonstrates logical reasoning in plan details and design
Identify ways to improve a wetland habitat. (A.S. 2)	Foundation Skills	Reading	Follows written directions; applies information to job performance
		Writing	Presents answers in a clear and understandable form
		Science	Applies principles and concepts of biology
	Thinking Skills	Reasoning	Uses logic to draw conclusions from available information
Determine the carrying capacity of a pond. (A.S. 3)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Math	Applies basic computation skills as they are used on the job
Determine the carrying capacity of a rangeland habitat. (A.S. 4)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Math	Applies basic computation skills as they are used on the job
Survey non-game birds at a feeding station. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task; uses written resources to obtain factual information
		Writing	Records data through observation; analyzes data, summarizes results, and makes conclusions in report; applies rules of grammar, punctuation, capitalization, and spelling; produces a neat, legible document

Task	Skill Group	Sub Skill	Description
Unit 9: (continued)			
		Science	Applies scientific knowledge to complete a task
	Thinking Skills	Creative thinking	Forms opinions; combines ideas or information in a new way
		Decision making	Makes recommendations based on observations
Survey wildlife foods. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task; uses written resources to obtain factual information
		Writing	Records data through observation; analyzes data, summarizes results, and makes conclusions in report; applies rules of grammar, punctuation, capitalization, and spelling; produces a neat, legible document
		Science	Applies scientific knowledge to complete a task
	Thinking Skills	Creative thinking	Forms opinions; combines ideas or information in a new way
		Reasoning	Uses logic to draw conclusions from available information
Survey for wildlife signs. (A.S. 3A)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain information
		Writing	Organizes information into an appropriate format; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Applies scientific principles to complete a task
		Listening	Listens for content
		Speaking	Asks questions to obtain/clarify information
	Thinking Skills	Problem solving	Demonstrates logical reasoning in reaching a conclusion
Develop a management plan for a farm pond for sport fishing. (A.S. 4A)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task
		Writing	Organizes information into an appropriate format; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Applies principles and concepts of biology
	Thinking Skills	Creative thinking	Combines ideas or information in a new way; develops visual aids to depict project plans
		Problem solving	Devises and implements a plan of action to improve an existing condition
		Reasoning	Sees relationship between two or more ideas, objects, or situations

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 9: (continued)			
Analyze current reports concerning wildlife habitats. (A.S. 5A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—wildlife management
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
		Decision making	Identifies pros and cons to assist in decision making; evaluates information to make best decision
		Problem solving	Demonstrates logical reasoning in reaching a conclusion
Construct nesting sites. (J.S. 1A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information and applies it to a task
		Writing	Organizes information into an appropriate format; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Solves practical problems using scientific techniques
		Listening	Listens for content
		Speaking	Asks questions to obtain/clarify information
	Thinking Skills	Problem solving	Devises and implements a plan of action to resolve a problem; tracks and evaluates results
	Interpersonal Skills	Teamwork	Works effectively with others to reach a common goal
	Resources	Material and facilities	Obtains and uses materials correctly
Increase hummingbird habitat. (J.S. 2A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information and applies it to a task
		Writing	Organizes information into an appropriate format; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Solves practical problems using scientific techniques

Task	Skill Group	Sub Skill	Description
Unit 9: (continued)			
		Listening	Listens for content
		Speaking	Asks questions to obtain/clarify information
	Thinking Skills	Problem solving	Devises and implements a plan of action to resolve a problem; tracks and evaluates results
	Interpersonal Skills	Teamwork	Works effectively with others to reach a common goal
	Resources	Material and facilities	Obtains and uses materials correctly
Unit 10: Outdoor Recreation			
Identify outdoor recreation activities and facilities available locally. (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Writing	Presents answers in a clear and understandable form; writes/prints legibly
	Thinking Skills	Reasoning	Uses logic to draw conclusions from available information
Make a presentation about an outdoor recreation activity. (A.S. 2)	Foundation Skills	Reading	Follows written directions; determines what information is needed
		Writing	Takes notes from various sources; organizes information into an appropriate format
		Speaking	Organizes and presents thoughts and facts in spoken form; speaks effectively using appropriate eye contact, gestures, and posture
	Thinking Skills	Creative thinking	Prepares presentation based on subject research; develops visual aids to create audience interest
Interpret graphs on future trends in outdoor recreation. (A.S. 3)	Foundation Skills	Reading	Follows written directions; uses graphs to obtain factual information
		Writing	Writes/prints legibly
Evaluate a local outdoor recreation site. (A.S. 4)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Writing	Presents conclusions in a clear, concise manner; writes/prints legibly
	Thinking Skills	Problem solving	Draws conclusions from observations and evaluates conditions and gives possible solutions
Plan and design a new outdoor recreation area. (A.S. 5)	Foundation Skills	Reading	Follows written directions; locates pertinent information in written resources to obtain factual information; comprehends written information and applies it to a task

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 10: (continued)			
		Writing	Organizes information into an appropriate format; presents own opinion in written form in a clear, concise manner; produces neat, legible document
		Speaking	Communicates a thought, idea, or fact in spoken form; speaks effectively using appropriate eye contact, gestures, and posture
	Thinking Skills	Creative thinking	Uses imagination to create something new; prepares presentation based on subject research and own ideas; develops visual aids to create audience interest
		Reasoning	Extracts rules or principles from written information and applies them to a new situation
Research local employment opportunities in outdoor recreation. (A.S. 6)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information
		Writing	Writes appropriate entries; writes/prints legibly
	Thinking Skills	Reasoning	Uses logic to draw conclusions from available information
Develop a historical presentation for visitors to your area. (A.S. 1A)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; determines what information is needed
		Writing	Takes notes from various sources
		Listening	Listens for content
		Speaking	Adapts presentation to audience; participates in a group skit; speaks effectively using appropriate eye contact, gestures, and posture
	Thinking Skills	Creative thinking	Combines ideas or information in a new way; prepares skit based on subject research and interviews
		Seeing things in the mind's eye	Visualizes a role in a skit
	Personal Management Skills	Responsibility	Maintains a high level of concentration in completing a task
	Interpersonal Skills	Teamwork	Contributes to group with ideas, suggestions, and effort; works effectively with others to reach a common goal
		Cultural diversity	Respects others' personal values, cultures, and traditions

Task	Skill Group	Sub Skill	Description
Unit 10: (continued)			
	Information	Acquisition	Acquires information from existing resources
		Interpretation	Selects and analyzes information from a variety of sources and communicates the results to others through a skit
Evaluate conflict resolution scenarios. (A.S. 2A)	Foundation Skills	Reading	Follows written directions; draws conclusions from what is read
		Writing	Presents conclusions in a clear and understandable form; writes/prints legibly
	Thinking Skills	Decision making	Identifies pros and cons to assist in decision making process; evaluates information to make best decision
		Problem solving	Recognizes problem; demonstrates logical reasoning in reaching a conclusion
	Interpersonal Skills	Negotiation	Works to resolve conflict between two or more individuals
		Customer service	Maintains positive relations with customers; works with customers to satisfy their expectations
Give accurate, easy-to-follow directions. (A.S. 3A)	Foundation Skills	Reading	Follows written directions
		Writing	Communicates directions in written form in a clear, concise manner; writes/prints legibly
	Thinking Skills	Decision making	Considers alternatives to assist in making best decision
Locate constellations in the night sky. (A.S. 4A)	Foundation Skills	Reading	Follows written directions; comprehends written information and applies it to a task
		Science	Applies principles and concepts of astronomy
		Speaking	Communicates information verbally
Analyze current reports concerning the growth of outdoor recreation and its effects on the environment. (A.S. 5A)	Foundation Skills	Reading	Follows written directions; locates pertinent information in documents; comprehends written information for main ideas
		Writing	Analyzes and summarizes written information; applies rules of grammar, punctuation, capitalization, and spelling; produces neat, legible document
		Science	Analyzes environmental issues—outdoor recreation
	Thinking Skills	Creative thinking	Forms opinions; prepares report based on subject research
		Decision making	Identifies pros and cons to assist in decision making; evaluates information to make best decision

Related Academic and Workplace Skills

Task	Skill Group	Sub Skill	Description
Unit 10: (continued)			
		Problem solving	Demonstrates logical reasoning in reaching a conclusion
Build a wood-conserving Dakota fire hole. (J.S. 1A)	Foundation Skills	Reading	Follows written directions; comprehend written information and applies it to a task
		Math	Makes rough measurements
	Resources	Material and facilities	Obtains equipment and materials to accomplish task; demonstrates safe use of equipment

Equipment and Materials List

Aluminum flashing
Aluminum soft drink cans
Animal manure/water slurry, 1.5 liters
Aquarium pump (or other source of low-pressure air)
Auger-type post hole digger
Bareroot tree
Binoculars
Bird feeders
Bird nesting kits or plans
Birdhouse plans
Bird seed
Blower motor, small
Boards, 2×4×8
Bunsen burner or similar device
Camera, flash attachment, film
Carpenter tape
Charged hose
Compostable materials
Concrete blocks
Cooking utensils for campfire
CPR dummy
Dial thermometer
Diameter tape
Erlenmeyer flasks, 2 liter (3)
Eye dropper
Firewood
Flexible ducting
Flowers or flower seed
Food to prepare at campsite
Garden hose
Garden tools
Gas-tight valve fitted to tubing
Glass jar with lid
Glass or Tygon tubing
Gloves
Ground cloth
Heat lamp
Hummingbird feeder
Knife
Landscape timbers or railroad ties
Large, heavy box
Lower-back support belt
Marking pens
Matches or lighter
Mesh wire
Paper and pencil
Peat moss or other organic matter
Petroleum jelly, clear
Plant seeds or seedlings
Plastic bucket
Plastic sheeting
Plate glass, 48″×64″ approx.
Plywood, ⅜″ or ½″
Portable fire extinguisher
Poster board, white (2)
Reference library (books, magazines, newspaper)
Rubber stoppers (3)
Safety equipment such as gloves, hard hats, eye and ear protection
Screws
Shovel
Silicone caulking material, high temperature
Sodium hydroxide
Soil samples
Soil sampling information sheet
Soil sampling kit
Soil tube, soil auger
Spoon
Spray paint, black
Star chart
Telephone book or business directory
Tool kit, basic
Trash assortment
Tree scale stick (Biltmore)
Water
Water buckets
Wildlife brochures
Wire grill
Yardsticks (8-10)

Note: You also need to arrange for county or state air monitoring, soil testing, and water analysis so students can complete corresponding assignment sheets.

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Outdoor Safety and First Aid
Unit 1

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Poisonous Plants (Objective 5)
  TM 2—Components of the Fire Triangle (Objective 8)
  TM 3—Classes of Fires and Their Fire Extinguisher Symbols (Objectives 9 and 10)
  TM 4—How to Lift Safely (Objective 12)
  TM 5—How to Lift Safely (Continued) (Objective 12)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Post copies of the correct lifting procedures and classes of fires and their fire extinguisher symbols which are printed in the transparency master section of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignment sheets, and plan presentation.

Suggested Activities

Advanced Student Supplements

1A—Guidelines for Interpreting Material Safety Data Sheets
2A—Sample MSDSs

Advanced Assignment Sheets

1A—Interpret Material Safety Data Sheets
2A—Analyze Current Reports Concerning Outdoor Safety and First Aid

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets and job sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Invite a certified Red Cross instructor, EMT, and/or rescue team member to discuss and demonstrate proper first-aid procedures. Arrange for a practice dummy for students to practice CPR techniques and/or the Heimlich maneuver. **(Listening; speaking; applying scientific knowledge)**
- If your class does not have a first-aid kit, have students assemble a first-aid kit to take on field trips. (See Objective 3.) **(Acquiring needed resources; teamwork)**
- Arrange for a naturalist or reptile specialist to conduct a live-animal demonstration for class members, to enable them to see various species of poisonous and non-poisonous snakes, spiders, and lizards. Conduct a question and answer period following the demonstration. **(Listening; speaking; acquiring scientific information)**

Suggested Activities

- Obtain a compact snake bite kit for demonstration purposes. Lead the class in a discussion concerning the use of the various items found in the kit. **(Listening; speaking; acquiring life-saving information)**
- Check with your local fire department about the possibility of having a department representative demonstrate the use of several common types of fire extinguishers. Ask if the department has a safe area where students can learn to put out fires using portable fire extinguishers. If so, have students complete Job Sheet 2. If not, have the fire department assist you in establishing a safe area for students to practice using a fire extinguisher. **(Listening; following directions)**
- Demonstrate proper lifting techniques, following the steps in Job Sheet 3. **(Listening)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.
- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.
- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate written test.
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

Suggested Activities

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Suggested Resources

Resources Used in Developing This Unit

- *Family Medical Guide*. New York, NY: Better Homes and Gardens Books, Meredith Corporation, 1993.
- *Forestry*. Stillwater, OK: Curriculum and Instructional Materials Center, Oklahoma Department of Vocational and Technical Education, 1991.
- *Grollier's Academic American Encyclopedia*. Columbus, OH: CompuServe, Inc., 1994.
- *Introduction to Hospitality and Tourism*. Stillwater, OK: Mid-America Vocational Curriculum Consortium, 1993.

Suggested Activities

- *Oklahoma Hunter Education Manual.* Seattle, WA: Outdoor Empire Publishing, Inc., 1993.

Supplemental Resources

Print Media

- Conant, Roger. *A Field Guide to Reptiles and Amphibians: Eastern and Central North America.* Boston, MA: Houghton Mifflin Company, 1986.
- *Fire Service First Responder*, 1st ed. Stillwater, OK: International Fire Service Training Association/Fire Protection Publications, 1987.
- *MSDS Pocket Dictionary.* Schenectady, NY: Genium Publishing Corporation, 1989.
- Simon, Hilda. *Easy Identification Guide to North American Snakes.* New York: Dodd, Mead, and Company.
- Webb, Robert G. *Reptiles of Oklahoma.* Norman, OK: University of Oklahoma Press.

Non-print Media

- Bob Jenni Nature Center, 4601 East 2nd, Edmond, Oklahoma 73034. (405) 340-8105. (Outdoor educational material and presentations)
- National Safety Council, Public Relations Department, 1121 Spring Lake Drive, Itasca, IL 60143-3201. Phone: (708) 775-2307. (Publications and audio-visual material)
- The R.E.A.C.T. series of first-aid and safety color videos is an MTI release produced by Charles S. MacCrone Production, Inc., but is available in ½ inch VHS format from Coronet Films, 65 E. South Water Street, Chicago, IL 60601. (800) 621-2131. Titles in this series are listed and described below.

  Oklahoma teachers may order this series of videos from the Instructional Media Center of the Oklahoma Department of Vocational and Technical Education. All other teachers must order the videos from the address above.

  — *Care for a Choking Victim Who is Unconscious*, 8 min., copyright 1984.

  — *First Aid for Injuries to Bones, Muscles, and Joints*, 10 min., copyright 1984.

  — *Mouth-to-Mouth Breathing*, 11 min., copyright 1984.

Suggested Activities

- *Ticks and Lyme Disease*, 18 min. U.S. Forest Service. Available from the Forestry Extension Program at Oklahoma State University, 242 Agricultural Hall, Stillwater, OK 74078. (405) 744-5444.
- *Venomous and Nonvenomous Snakes of Oklahoma*, 16 color slides. Available from Curriculum and Instructional Materials Center, Oklahoma Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, OK 74074. Oklahoma teachers may call toll free (800) 522-5810, ext. 589. Out-of-state teachers may call toll free (800) 654-4502.

Outdoor Safety and First Aid
Unit 1

Answers to Student Supplement 5

1. a. elevated
   b. antiseptic cream

2. a. Locate entrance and exit wounds; cool with damp compress; cover with dry sterile dressing; cover victim with blanket; elevate feet and legs to prevent shock and loss of body heat
   b. Cool with a damp compress, taking care not to break the blisters, then cover with a dry, sterile dressing to prevent infection
   c. Third-degree burns should be cooled with a damp compress and covered with dry sterile dressing; cover victim with a blanket; elevate feet and legs to prevent shock and loss of body heat

3. Any three of the following, in any order:

   - Pale or bluish skin that is cool to touch
   - Moist, clammy skin if perspiration has occurred
   - General weakness
   - Rapid, weak pulse
   - Rapid, shallow, possibly irregular breathing
   - Restlessness or anxiety
   - Vomiting or nausea
   - Excessive thirst

4. In any order:

   - Lay victim down.
   - Elevate victim's legs slightly.
   - Cover to prevent loss of body heat.

5. a. control bleeding and shock
   b. check for injury and apply appropriate first-aid

6. a. Choking
   b. Perform the Heimlich maneuver

7. a. Be certain all electrical current is turned OFF.
   b. Administer CPR if necessary.
   c. Treat for shock.
   d. Treat for electrical burn.

8. move victim to a cool place

Answers to Student Supplement 5

9. In any order:

    - Little or no perspiration
    - Hot, flushed skin
    - Rapid, weak pulse
    - Rapid, shallow breathing

10. end exposure to cold and wet conditions

11. The possibility of disease such as rabies

12. In any order:

    - Lay victim down.
    - Elevate legs slightly.
    - Remove stinger and perform first aid for ordinary sting.

13. a, d, e, f, g

14. Be on guard for symptoms of diseases such as Lyme disease and/or Rocky Mountain spotted fever.

15. In any order:

    - Aspirin
    - Acetaminophen

16. In any order:

    - Antiseptic to kill bacteria
    - Adhesive bandages
    - Gauze pads, various sizes
    - Gauze roller bandages
    - Triangular bandages for large wounds and slings
    - Scissors
    - Tweezers
    - Elastic bandages for sprains
    - Pain relievers
    - Snake bite kit

17. a

18. b

19. c

20. b, c, d

Answers to Student Supplement 5

21. c, d, e

22. In any order:

    - Black widow
    - Brown recluse

23. a. in a vehicle with the windows rolled up
    b. never drive into running water
    c. low lying areas
    d. carbon monoxide poisoning

24. In any order:

    - Fuel
    - Oxygen
    - Heat

25. a. Class B
    b. ordinary combustibles
    c. Class D
    d. Class C

Outdoor Safety and First Aid
Unit 1

Answers to Assignment Sheets

Assignment Sheet 1—Analyze Scenarios to Determine Appropriate Safety and First-Aid Procedures

Student performance should be evaluated according to criteria listed on the assignment sheet. Content of each item in the exercise may be evaluated using the following suggested responses.

1. According to a systematic look at first aid a "scene survey" should be taken of any emergency situation to determine if intervention would place the rescuer in danger. In this case, with the boom of the trenching machine still deep in the ditch there is the possibility the worker has accidentally brought the machine into contact with a buried electrical cable. If this is the case, the victim and the machine may both present an electrical hazard to the rescuer. Answer should include a taking of a "scene survey" at a minimum, and should include a discussion of possible hazards in this scenario.

2. a. Is the AIRWAY clear?
   b. Is their evidence of BREATHING?
   c. Is their evidence of blood CIRCULATING?

3. Answer should refer to the fact weather conditions should be monitored and taken into account before going afield. Also, Julio and Brett should get off the open high ground and take some shelter in any available ravines, then return to their vehicle as soon as possible to seek shelter from the lightning.

4. The victim is in a state of mild hypothermia and should be removed from the cold environment as soon as possible. In this case, the victim should be taken to the nearby truck which we assume is equipped with a heater. Also, the ranger should offer warm liquids (in this case the coffee in the Thermos-type container). And, if possible, the victim should be given warm clothing or blankets after getting out of his wet clothing.

5. Answer should include a discussion and description of the Heimlich maneuver according to Student Supplement 2. Answer should satisfy instructor that thorough understanding of Heimlich maneuver is grasped by the student.

6. LeRhonda's condition is traumatic shock and the steps to control that shock should be to keep her warm or warm her with blankets and/or body heat, elevate her legs somewhat, and evacuate her to medical care as soon as possible.

7. The hiker apparently has been bitten by a copperhead, a pit viper found in the southeastern third of the U.S., given the fang marks and the coloration of the suspected snake. Appropriate first aid in this case would involve keeping the victim calm while a constricting band is placed above the bite (probably just below the knee in this case) and suction applied to the wounds as soon as possible to remove as much venom as possible. Further action would include getting the victim to medical assistance as soon as possible.

Answers to Assignment Sheets

8. To ensure the campfire is no longer active, water from the stream should be used to cool and extinguish the fire. Once the fire is apparently extinguished, the remaining fuel (logs and branches) should be separated somewhat and additional water poured over them to further cool the fuel and rob "hot spots" of oxygen.

9. Federal law requires employers to maintain a file of material safety data sheets on various chemicals and materials employees may be asked to handle. In this case asking to read a copy of the MSDS on ammonium nitrate would be the most direct method of learning about the product and its characteristics.

10. A Class A fire extinguisher with some source of pressurized water is the correct answer.

Assignment Sheet 2—Interpret Portable Fire Extinguisher Symbols

Student performance should be evaluated according to criteria listed on the assignment sheet. Content of each item in the exercise may be evaluated using the following suggested responses.

1. a. 6
   b. 2
   c. 4
   d. 1
   e. 5
   f. 3

2. a. B; red
   b. A; green
   c. D; yellow
   d. C; blue

3. a. Pull pin
   b. Aim nozzle at base of fire
   c. Squeeze handle
   d. Sweep nozzle

Assignment Sheet 3—Read Wind Chill Index and Water Survival Charts

1. 1 to 6 hours
2. Under 15 minutes to 45 minutes
3. 30 to 60 minutes
4. 28 degrees F.
5. –25 degrees F.
6. 30 degrees F.

Outdoor Safety and First Aid
Advanced Applications
Unit 1

Answers to Advanced Assignment Sheets

Assignment Sheet 1A—Interpret Material Safety Data Sheets

MSDS 1

1. Ethylene glycol & glycols
2. Green hygroscopic liquid
3. (405) 424-3311 & (800) 424-9300
4. 748 degrees F.
5. Water spray, carbon dioxide, dry chemical, or foam
6. Carbon monoxide and carbon dioxide
7. Respiratory irritation, drowsiness, narcosis, unconsciousness
8. Possible irritation
9. Liver, kidney damage, drowsiness, narcosis, unconsciousness, death
10. Full-face supplied-air respirator

MSDS 2

1. Carbaryl
2. White to light tan solid
3. Dry chemical or CO_2 for small fires, water spray or foam for large fires
4. Irritation, tearing, or redness
5. Death
6. Nausea, vomiting, abdominal pain, diarrhea, blurred vision, sweating, salivation, tremors, paralysis, convulsions
7. NIOSH/MSHA approved respirator
8. Chemical-resistant gloves
9. Remove victim to fresh air
10. (800) 424-9300

MSDS 3

1. Ammonium nitrate
2. (919) 763-0171
3. Solid, white, odorless
4. Large volumes of low pressure water
5. Nitrogen oxide gases
6. Cyanosis, lowered blood pressure, rapid heartbeat, rapid breathing, abdominal pain, weakness, and collapse
7. Minor respiratory tract irritation
8. Slight irritation
9. NIOSH/MSHA approved dust respirator
10. None

Answers to Advanced Assignment Sheets

MSDS 4

1. (713) 473-9461 & (800) 424-9300
2. Atrazine
3. Ethylene glycol
4. Mild irritation
5. Minimal irritation
6. Kidney
7. Flush eyes with water for 15 minutes
8. Remove victim to fresh air and provide oxygen
9. Will not burn
10. Nitrogen oxides

Assignment Sheet 2A—Analyze Current Reports Concerning Outdoor Safety and First Aid

Student performance should be evaluated according to criteria listed on the assignment sheet.

Outdoor Safety and First Aid
Unit 1

Answers to Written Test

1.

a.	6	g.	8	m.	14	s.	22
b.	1	h.	4	n.	13	t.	18
c.	9	i.	11	o.	12	u.	21
d.	2	j.	5	p.	19		
e.	7	k.	10	q.	23		
f.	3	l.	15	r.	17		

2. a, c, e, g, h, j, k, n

3. Answers may appear in any order

   a. Antiseptic to kill bacteria
   b. Adhesive bandages
   c. Gauze pads, various sizes
   d. Gauze roller bandages
   e. Triangular bandages for large wounds and slings
   f. Scissors
   g. Tweezers
   h. Elastic bandages for sprains
   i. Pain relievers
   j. Snake bite kit

4. Answers may be in student's own words, but should include much of the following:

   a. Pit vipers

      - A pit between the eye and nostril on each side of the face
      - Vertically elliptical pupils
      - Usually two well-developed fangs capable of injecting venom which affects the victim's circulatory system and blood
      - One row of plates beneath the tail
      - Triangular-shaped head with a narrow neck
      - Range and color markings

        — Copperhead—Alternate light and dark brown saddle bands the full length of the body; found in the southeastern one-third of the U.S. from the Big Bend of Texas across the eastern two-thirds of Oklahoma, the eastern third of Kansas to extreme southeastern Nebraska and eastward to New York State
        — Cottonmouth—Dark brownish-black with indistinct bands (although many snakes are similarly marked); large scales over the eye preventing upward vision and facial pit are easily distinguished; found in the southeastern one-fourth of the U.S. in generally slow-moving and stagnant waters

- Rattlesnake—Rattles, facial pits; markings differ among the more than 30 species and subspecies of rattlesnakes; found in isolated areas throughout the lower 48 states of the U.S.

b. Coral snake

- Tubular fangs that inject a highly toxic venom which attacks the victim's nervous system
- Round pupils
- A double row of plates beneath the tail
- Colorfully-banded markings of red, yellow, and black rings with red and yellow rings touching
- A black nose
- Range is eastern one-third of Texas, southern Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and northward across the coastal plain to southern North Carolina

5. a. O d. S
b. I e. O
c. S f. O

6. a. W d. W
b. R e. W
c. R f. R

7. Any two of the following for each type of inclement weather:

a. Lightning

- Take shelter in a vehicle with windows rolled up or in a building if possible.
- Avoid sheltering under trees.
- Avoid hilltops and open country during approach and duration of a thunderstorm.

b. Heavy rain

- Avoid low-lying areas, or obvious drainage areas when heavy thunderstorms are present (unless the direct approach of a tornado is imminent.)
- Never drive into running water.
- Take lightning precautions.

c. Tornado

- Seek shelter in low areas.
- If no shelter is available, move at right angles to the approach of the funnel cloud.
- Do not seek shelter in an automobile or mobile home.

Answers to Written Test

d. Winter storm

- Be alert to weather forecasts.
- Be prepared with food, water, and sheltering material such as blankets, tents, and candles.
- Be alert to signs of hypothermia if stranded in a winter storm.
- Take precautions to avoid carbon monoxide poisoning if stranded in a vehicle. Snow may build up around exhaust system.

8. Answer may be in student's own words, but should include the following:

The fire triangle represents the three components that are needed for fire. Combustion can occur only when the fire triangle is complete.

Oxygen must be available in the air and the more oxygen a fire has, the faster and hotter it will burn. Wind brings more oxygen to a fire. Remove the oxygen supply to break the fire triangle.

Fuel is anything that burns at the fire site. Examples are dried grass or leaves, small trees, large trees and limbs, brush, stumps, gasoline, oil, and paper. The arrangement of the fuel will affect the amount of heat. The temperature must be high enough to ignite the fuel. The source of fuel must be eliminated to stop a fire.

Heat comes from the fire itself and, as long as there is plenty of fuel and oxygen, a fire will continue to burn, producing greater heat. The temperature must be high enough to ignite the fuel. Heavy fuels such as logs or lumber burn hotter. When the heat is removed, the fire triangle is broken.

9. a. 4
b. 2
c. 3
d. 1

10. a. 4
b. 3
c. 1
d. 2

11. a. 3
b. 1
c. 4
d. 2
e. 2

12. a. 4
b. 3
c. 2

Outdoor Safety and First Aid
Unit 1

Written Test

Name ______________________ Date ______________ Score __________

1. Match terms related to outdoor safety and first aid with their definitions. Write the corresponding numbers on the blanks provided. Terms and definitions continue on next page.

______a. Failure to think before one acts; failure to pay attention

______b. Any suddenly occurring, unintentional event that causes injury or property damage

______c. Tissue damage due to freezing of tissue fluids

______d. A substance that causes loss of the sense of pain or itching

______e. Immediate temporary care given the victim of an accident or sudden illness or trauma until the services of a physician can be obtained

______f. A substance that prevents infection by killing bacteria

______g. Burn affecting only the outer skin layers; characterized by redness and pain

______h. Stoppage of the involuntary beating of the heart

______i. The region where a plant or animal naturally grows or lives

______j. Procedure for restoring normal breathing after cardiac arrest

______k. Electrical connection to an object that conducts electrical current to the earth

______l. Potential source of danger

1. Accident
2. Anesthetic
3. Antiseptic
4. Cardiac arrest
5. Cardiopulmonary resuscitation (CPR)
6. Carelessness
7. First aid
8. First-degree burn
9. Frostbite
10. Grounded
11. Habitat
12. Hazard

Written Test

______m. Muscular pains and spasms due to loss of salt through sweating

______n. Any cancer-causing, corrosive, toxic, irritant, oxidizer, or other material that has the potential to damage specific body organs

______o. Fatigue, weakness, and sometimes collapse due to loss of body fluids through sweating and lack of adequate water intake

______p. Form that lists and explains each of the hazardous materials that an employee works with so the employee can safely use the material and respond to emergency situations

______q. Burn that destroys all skin layers and underlying tissue; characterized by charring or white, leathery appearance of the skin and lack of pain

______r. Procedure for forcing a foreign object from the windpipe of a choking victim

______s. A medical condition in which the operation of the circulatory system is partially or completely impaired by the body's reaction to injury or psychic disturbance

______t. Below normal body temperature usually due to overexposure to low temperatures

______u. Burn penetrating beneath the superficial skin layers; characterized by swelling and blisters

13. Hazardous material
14. Heat cramps
15. Heat exhaustion
16. Heat stroke
17. Heimlich maneuver
18. Hypothermia
19. Material safety data sheet
20. Safety
21. Second-degree burn
22. Shock
23. Third-degree burn
24. Topical

2. Select true statements concerning basic first-aid procedures for emergency situations. Place an "X" in the blanks next to the true statements.

______a. Apply antiseptic solution or cream and dress wound with sterile bandages to treat minor bleeding.

______b. Chemical burns should be treated by submerging burned area under cold water, then applying a dry, sterile dressing.

______c. Some early signs and symptoms of traumatic shock include the following: pale or bluish skin; rapid, weak pulse; vomiting or nausea; and excessive thirst.

______d. A victim of traumatic shock should be cooled with a damp cloth to reduce body heat.

_______e. Do not move a victim or allow victim to move if a neck or back injury is suspected.

_______f. A victim who has trouble speaking or breathing, has pale to bluish skin, and loses consciousness is suffering from heat exhaustion.

_______g. In the event of an electrical accident, **do not** provide any assistance until all electrical current has been shut off.

_______h. A heat stroke victim should be moved immediately to a cool place.

_______i. Victims of moderate or severe hypothermia cease shivering.

_______j. For animal bites, cleanse wound thoroughly with soap and water and apply antiseptic.

_______k. Victims of an allergic reaction to a bee sting should be evacuated to a physician's office or hospital emergency room immediately.

_______l. Hot and cold compresses, alternated every 3 to 5 minutes, should be applied on coral snake bites.

_______m. Carefully remove an imbedded tick by grabbing the tick between the thumb and forefinger and pulling quickly straight out.

_______n. Cold water or ice and a topical antiseptic may be used to treat spider bites.

3. List ten items that should be found in a basic first-aid kit.

a. ________________________ f. ________________________

b. ________________________ g. ________________________

c. ________________________ h. ________________________

d. ________________________ i. ________________________

e. ________________________ j. ________________________

4. Describe the two types of poisonous snakes found in the United States.

a. Pit vipers—____

____

____

____

____

Written Test

b. Coral snake—____

____

____

____

____

5. Distinguish among types of poisonous plants found in the United States. Place an "I" for poison ivy, an "O" for poison oak, and an "S" for poison sumac in the blanks next to their characteristics.

______a. Plant grows in shrub and sometimes vine form

______b. Leaves always consist of three glossy leaflets

______c. Grows in most of the eastern third of the United States

______d. Grows as a woody shrub or small tree from 5 to 25 feet tall

______e. Grows in California and parts of adjacent states

______f. Sometimes called yeara

6. Distinguish between the two types of poisonous spiders found in the United States. Place a "W" for black widow and an "R" for brown recluse in the blanks next to their characteristics.

______a. Bite looks like a pin prick; severe pain caused by nerve toxins begins within minutes accompanied by sweating, cramps, nausea, and difficult speaking and breathing

______b. Found in buildings, closets, old clothes, on undersides of tables and chairs, and under rocks and bark

______c. Dark "fiddle or violin" design on back of thorax

______d. Orange hour glass" design on its abdomen

______e. Found in trash dumps, ash piles, under boxes, crates, stones and wood piles, and in outdoor toilet facilities

______f. Bite area swells painfully and grows hard; blisters or ulcers form and a rash may cover the body within 24-48 hours; accompanied by chills, vomiting, nausea, and fever

Written Test

7. List two safety precautions to take for each type of inclement weather.

   a. Lightning

   - ______________________________
   - ______________________________

   b. Heavy rain

   - ______________________________
   - ______________________________

   c. Tornado

   - ______________________________
   - ______________________________

   d. Winter storm

   - ______________________________
   - ______________________________

Written Test

8. Explain how the components of the fire triangle work.

____

____

____

____

____

9. Match classes of fires with their definitions. Write the corresponding numbers on the blanks provided.

______ a. Fires that occur with combustible metals such as magnesium, phosphorus, or sodium

______ b. Fires that occur with flammable liquids such as gasoline, oil, grease, paint, solvent, and thinners

______ c. Fires that occur in or near electrical equipment such as motors, switchboards, and electrical wiring

______ d. Fires that occur in ordinary combustible materials such as wood, rags, paper, and rubbish

1. Class A
2. Class B
3. Class C
4. Class D

10. Match types of fire extinguishers with the classes of fires for which they were designed. Write the corresponding numbers on the blanks provided.

______ a. Used on Class A fires

______ b. Used on Class A and B fires

______ c. Used on Class B and C fires

______ d. Used on Class B, C, and D fires

1. Carbon dioxide (CO)
2. Dry chemical
3. Foam
4. Pressurized water

Written Test

11. Complete statements concerning purposes of a material safety data sheet (MSDS). Write the correct number on the blank provided before each item.

______a. To inform ____________ of the material's physical properties or fast-acting health effects that make it dangerous to handle

1) OSHA
2) the management
3) the user
4) the health department

______b. To tell the user the level of ____________ needed

1) protective gear
2) medical care
3) hygiene
4) management

______c. To tell the user the ____________ necessary if exposed to the product or its hazards

1) preplanning
2) OSHA regulations
3) legal actions
4) first-aid treatment

______d. To tell the management and the user the ____________ needed for safely handling spills, fires, and day-to-day operations

1) legal actions
2) preplanning
3) equipment and materials
4) personnel resources

______e. To tell the user how to ____________ accidents

1) report
2) respond to
3) prevent
4) record

12. Complete statements concerning guidelines for lifting and carrying items safely. Write the correct number on the blank provided before each item.

______a. Place your ____________ as close to the load as possible.

1) head
2) shoulders
3) hip
4) feet

______b. Do not ___________ or twist your body to change direction.

1) set the load down
2) turn your head
3) change your grip
4) adjust your footing

______c. To set the load down, bend your ___________ .

1) arms
2) knees
3) back
4) head

***Permission to duplicate this test is granted.**

Outdoor Safety and First Aid
Unit 1

Unit Evaluation Form

Student Name ______________________________ Unit Rating ____________

Assignment Sheet Ratings

Assignment Sheet 1—Analyze Scenarios to Determine Appropriate Safety and First-Aid Procedures Rating ______

Comments: ____

____

Assignment Sheet 2—Interpret Portable Fire Extinguisher Symbols Rating ______

Comments: ____

____

Assignment Sheet 3—Read Wind Chill Index and Water Survival Charts Rating ______

Comments: ____

____

Job Sheet Ratings

Job Sheet 1—Demonstrate the Heimlich Maneuver for an Adult Choking Victim Rating ______

Comments: ____

____

Job Sheet 2—Operate a Fire Extinguisher Rating ______

Comments: ____

____

Unit Evaluation Form

Job Sheet 3—Lift and Carry a Heavy Object Properly Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet 1A—Interpret Material Safely Data Sheets Rating ______

Comments: ____

____

Assignment Sheet 2A—Analyze Current Reports Concerning
Outdoor Safety and First Aid Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

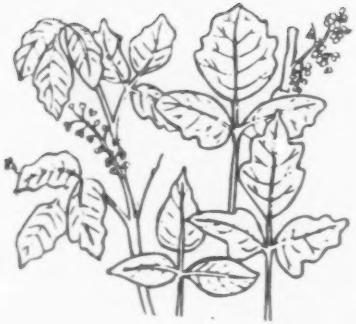
____

Teacher Signature ______________________________ Date ______________

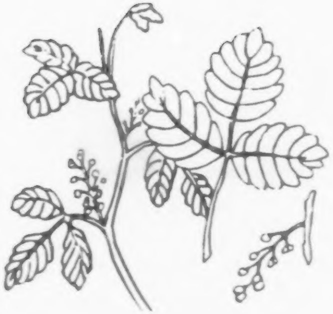
Student Signature ______________________________ Date ______________

*Permission to duplicate this form is granted.

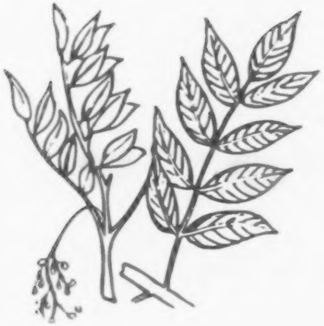
Poisonous Plants



Poison Ivy

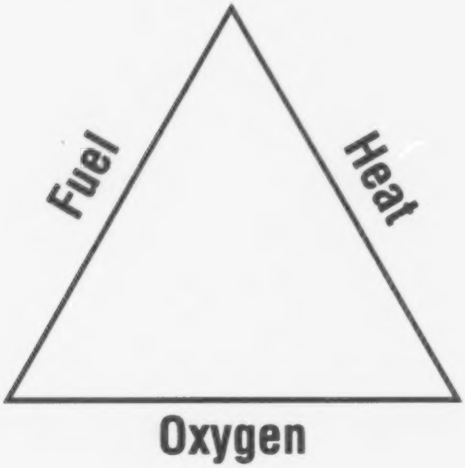


Western Poison Oak

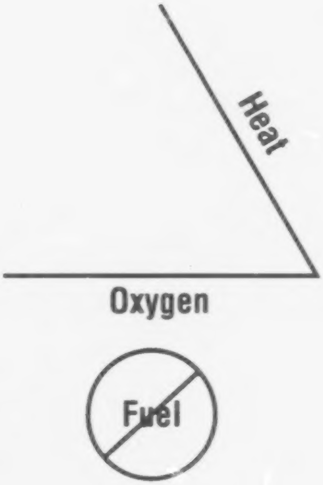


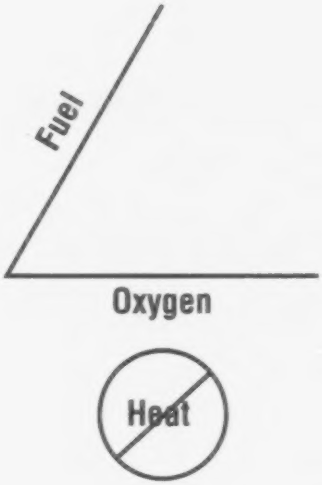
Poison Sumac

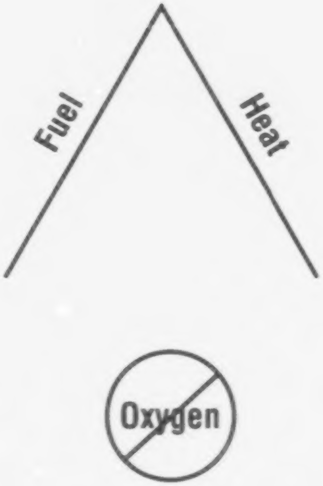
Components of the Fire Triangle



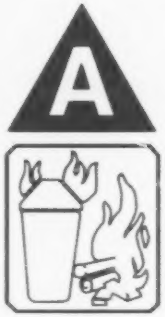
To produce fire, the three elements of the fire triangle must be present at the same time. If any one of the three is missing, a fire cannot be started. With the removal of any one element, the fire will be extinguished.





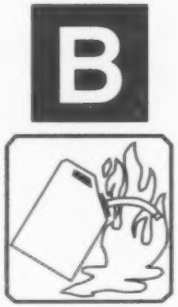


Classes of Fires and Their Fire Extinguisher Symbols



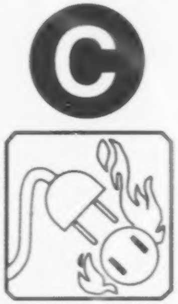
Class A
(Green)

- Ordinary combustibles



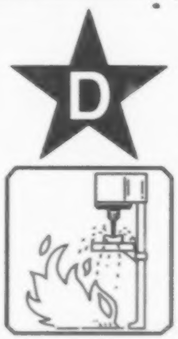
Class B
(Red)

- Flammable liquids and gases



Class C
(Blue)

- Live electrical equipment



Class D
(Yellow)

- Combustible metals

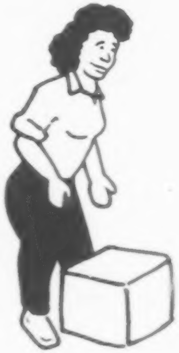
How to Lift Safely

1

Approach the load and size it up as to weight, size, and shape. Consider your physical ability to handle the load.

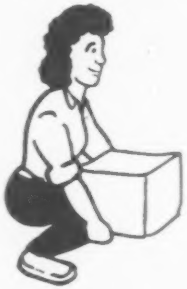
2

Place feet close to the object to be lifted and 8 to 12 inches apart for good balance.



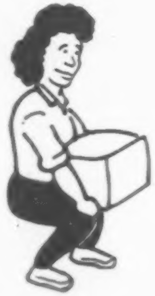
3

Bend the knees to the degree that is comfortable and get a good handhold. Then using both leg and back muscles . . .



4

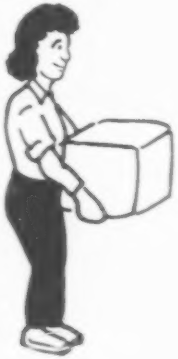
Lift the load straight up smoothly and evenly. Push with your legs, and keep the load close to your body.



How to Lift Safely
(Continued)

5

Lift the object into carrying position, making no turning or twisting movements until the lift is completed.



6

Turn your body with changes of foot position after looking over your path of travel, making sure it is clear.

7

Setting the load down is just as important as picking it up. Using leg and back muscles, comfortably lower load by bending your knees. When load is securely positioned, release your grip.

Natural Resources and Conservation
Unit 2

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Renewable Natural Resources (Objective 2)
  TM 2—Nonrenewable Natural Resources (Objective 2)
  TM 3—Basic Components of the Physical Environment (Objective 3)
  TM 4—Types of Pollution (Objective 7)
  TM 5—Solid Waste (Objective 12)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplement, assignment sheets, and job sheet, and plan presentation.

  Advanced Student Supplement

  1A—The Hows and Whys of Compost

Suggested Activities

Advanced Assignment Sheets

1A—Trace Route of Recyclable Products
2A—Complete a Class Community Service Project
3A—Analyze Current Reports Concerning Natural Resources and Conservation Conflict Areas

Advanced Job Sheet

1A—Build and Use a Composting Site

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of each of these activities.
- If you plan to use Job Sheet 1A, discuss procedure before students begin building composting site. Review with students the criteria for evaluation of this activity.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Conduct a classroom discussion on natural resources in your area and local industries that use natural resources. **(Listening; speaking)**
- Prepare a representative sample of garbage from home making sure that there are no harmful objects such as broken glass or medication in the contents. Then have students separate the garbage and determine what percentage is paper, aluminum, food, plant material, plastic, metal, glass, and other. **(Problem solving; acquiring information; math; teamwork)**

Suggested Activities

- Work with students to start a recycling club in your school. Let them plan and organize the activities. **(Decision making; teamwork; leadership; listening; speaking; writing; utilizing resources)**
- Have students share the information they collected in Assignment Sheet 4 concerning local businesses and industries involved with natural resources. Discuss career opportunities that were identified. **(Speaking; listening; career awareness)**
- Invite a guidance counselor to talk to students about the various careers in natural resources and education requirements. Give students an opportunity to ask questions about careers they are interested in. **(Listening; speaking; career awareness)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.
- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.
- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet.
- Evaluate job sheet (if used). See the evaluation criteria listed at the top of the job sheet.
- Give and evaluate written test.
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

Suggested Activities

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Suggested Resources

Resources Used in Developing This Unit

- *Applied Biology/Chemistry*. Waco, TX: Center for Occupational Research and Development, 1989.
- Camp, William G. *Managing Our Natural Resources*. Albany, NY: Delmar Publishers Inc., 1988.
- *Earth's Threatened Resources*. Washington, DC: Editorial Research Reports, 1986.
- Kircher, Harry B. *Our Natural Resources and Their Conservation*, 6th ed. Danville, IL: The Interstate Printers & Publishers, Inc., 1988.

Suggested Activities

Supplemental
Resources

Print Media

- Resource Directories. *Guide to Federal Jobs*, 2nd ed. Toledo, Ohio.

Non-print Media

- *Problems of Conservation Series*
  - *Soil*, 14 min.
  - *Water*, 16 min.
  - *Forest and Range*, 14 min.
  - *Wildlife*, 13 min.
  - *Our Natural Resources*, 11 min.
  - *Air*, 15 min.
  - *Minerals*, 17 min.

  Available from:

  Britannica Films and Video
  425 N. Michigan Avenue
  Chicago, IL 60611
  800-558-6968

- *Restoring the Environment*. 26 min., VHS or Beta. Discusses ways to correct environmental problems that technology has created. Available from:

  Films for the Humanities and Sciences
  P.O. Box 2053
  Princeton, NJ 08543
  800-257-5126

- *Territory in Conflict*. 29 min. ½" or ¾" video. Presents both sides of a conflict between townspeople of Crested Butte, Colorado wanting to preserve their environment and AMAX, an international corporation, wanting to mine the molybdenum in the mountains overlooking the town. Award winner. Available from:

  Centre Productions, Inc.
  Distributed by Barr Films
  12801 Schabarum Ave.
  P.O. Box 7878
  Irwindale, CA 91706-7878
  818-338-7878

Natural Resources and Conservation
Unit 2

Answers to Written Test

1.

a.	11	e.	9	i.	7	m.	12
b.	1	f.	3	j.	5	n.	16
c.	10	g.	8	k.	6	o.	13
d.	2	h.	4	l.	17	p.	15

2. Renewable resources can be replaced after they have been used, but nonrenewable resources cannot be replaced in a lifetime after they are used.

3. a. Air
   b. Water
   c. Soil
   d. Sunlight

4. b, c

5. Answer may be in student's own words, but should include the fact that natural resources are needed for our survival.

6. Any four of the following:

   - Wetlands needed by wildlife are drained and used for crop production.
   - Agricultural land needed for food production is paved in urban development.
   - Publicly owned forests needed for recreation are harvested for timber.
   - Publicly owned forests needed for lumber (and the jobs involved in the timber industry) are placed off limits for harvest by recreation and preservation interests.
   - Hunting is resisted by animal rights activists.
   - Many development and agricultural activities destroy wildlife habitat.
   - Swamps supporting a diversity of plants and animals are drained for urban and suburban development.
   - Recreational uses of rural land can disrupt wildlife, and damage vegetation and landscapes.
   - Fossil-fuel-fired electrical generation plants pollute the air of people who use electricity.
   - Nuclear-powered electrical generation plants maintain clean air, but produce highly toxic waste products which must be stored and protected.
   - Agricultural chemicals aid in producing abundant food supplies, but can adversely affect surface and ground water.
   - Vehicles needed to transport people to their work places increase air pollution.

7. Any four of the following:

   - Natural occurrences
   - Air, water, and land pollution from various sources
   - Urbanization
   - Agricultural practices

Answers to Written Test

- Mining practices
- Drilling practices that may result in contamination of resources

8. b

9. Any five of the following:

    - Protect native animals and plants.
    - Protect migration routes and preserve suitable areas for migratory animals.
    - Manage harvested species through the use of fishing and hunting regulations.
    - Identify and protect endangered species and the ecosystems on which they depend.
    - Protect natural landscapes.
    - Restore and replant land areas altered by human activity.
    - Prevent wetland drainage for domestic or industrial use.
    - Manage fires either by extinguishing or by allowing them to burn themselves out if they benefit the ecological plan of the area.
    - Manage surface and ground water by controlling erosion and preventing pollution.
    - Manage air quality to protect human health, vegetation, visibility, wildlife, and fish.
    - Manage soils to prevent soil erosion, physical removal, or contamination by waste disposal.

10. Any two for each of the following:

    a. Air conservation

    - Since cars are major air polluters, keep your car tuned up, change fuel filters often, maintain emission control devices, and use unleaded gasoline.
    - Drive less, ride more. Use mass-transit, carpools, bicycles, or walk to work.
    - Avoid using toxic chemicals released into the air such as oven cleaners and window cleaners. Instead use water and soap, baking soda, or vinegar.
    - Protect the environment from chlorofluorocarbons (CFCs) which deplete the ozone layer. Check you automobile for air-conditioning leaks which can release CFCs.
    - Plant trees. These use carbon dioxide and produce oxygen. Trees also help to purify the air, moderate temperatures, and absorb noise.

    b. Water conservation

    - Use low-flow shower heads. Short showers also use less water than baths.
    - Use faucet aerators for each sink.
    - Run washing machines and dishwashers only when they are full.
    - Do not let faucets run while hand-washing dishes, brushing teeth, or shaving.
    - Water plants and lawns only as needed, and only in the morning to reduce evaporation.
    - Use fertilizers and pesticides conservatively to prevent groundwater contamination.
    - Fix leaky faucets or toilets.

Answers to Written Test

c. Soil conservation

- Keep soil covered with grass, ground covers, trees, and plants to prevent erosion.
- Use recommended conservation practices such as crop rotation, contouring, and terracing to protect the soil's fertility and to prevent erosion.
- Do not send toxic substances such as oil, pesticides, or batteries to the municipal landfill.

d. Energy conservation

- Seal leaks and cracks around doors and windows with caulking and weather stripping.
- Increase the insulation in your home to the maximum recommendation.
- Drive fuel-efficient vehicles.
- Use mass-transit, carpools, bicycles, or walk.
- Set hot water heater at 120°F instead of 140°F.
- Use a cooler wash and cooler rinse in washing machines.
- Turn down the heater at night.
- Use fluorescent lights instead of incandescent.
- Turn lights and TV off when not using them.
- Check for leaks around the refrigerator door. Also check the temperature. Set at 38°-42°.
- Use high-efficiency appliances and those with energy-saving features.
- Use microwave ovens and pressure cookers because they use less energy, and save time too.
- Use alternative energies (solar, wind) where possible to lessen demand on nonrenewable energies (fossil fuels).
- Use products that are recycled, recyclable, repairable, refillable, reusable, and long-lasting.

11. a. 2
b. 6
c. 4
d. 1
e. 5

12. c, d

13. a. 3 d. 1
b. 2 e. 3
c. 3 f. 1

14. a, b, d

15. a, b, c, e, f, g

Answers to Written Test

16.	a.	3	e.	1	h.	10	k.	13
	b.	2	f.	4	i.	14	l.	12
	c.	5	g.	9	j.	8	m.	11
	d.	6						

17. Any five of the following: (Students may list specific occupations.)

- Occupations that maintain and protect natural resources
- Occupations that collect and harvest natural resources
- Occupations that make products from natural resources
- Occupations that use products made from natural resources
- Occupations that convert natural resources to energy
- Occupations that provide services
- Occupations that enforce laws affecting natural resources
- Occupations that dispose of waste

18. Any three of the following:

- Identify government agencies and private industries that have jobs of interest to you.
- Become familiar with businesses and industries involved with natural resources.
- Request information and brochures related to your interests.
- Get job-related experience as soon as possible.
- Determine education required for various jobs.
- Secure summer employment or volunteer work in a related area.
- Get to know local individuals working in natural resources.

19. Any three of the following:

- Desires to work outdoors
- Desires to work in agricultural-related areas
- Has a concern for the environment
- Likes to interact with the natural environment
- Likes to work with people

Natural Resources and Conservation
Unit 2

Written Test

Name ______________________ Date ______________ Score __________

1. Match terms related to natural resources and conservation with their definitions. Write the corresponding numbers on the blanks provided. Definitions continue on next page.

_____a. Land, water, air, wildlife, sunlight, and human labor

_____b. A material that decomposes in the environment as a result of the activity of microorganisms

_____c. Waste material that poses a threat to human health

_____d. Lowering quality of a resource

_____e. Involving the world

_____f. Using up the total quantity of a resource

_____g. Hydrocarbon compounds derived from the remains of organisms buried millions of years ago

_____h. A unit of the environment comprising the interaction of all organisms and the physical components within a given geographic area

_____i. Changes in the environment caused by some form of management

_____j. One who studies the relationship between organisms and their environment

_____k. A species in immediate danger of becoming extinct

_____l. Useless, unwanted, or discarded material

_____m. Layer of the atmosphere that protects the earth from ultraviolet radiation in sunlight

1. Biodegradable
2. Degradation
3. Depletion
4. Ecosystem
5. Ecologist
6. Endangered species
7. Environmental impact
8. Fossil fuels
9. Global
10. Hazardous (Toxic waste)
11. Natural resources
12. Ozone layer
13. Pollution
14. Protected
15. Recycling
16. Urbanization
17. Waste

Written Test

______n. Growth or expansion of cities

______o. A reduction in the quality of the environment by the introduction of impurities

______p. Transforming waste products into new products

2. Explain the difference between renewable and nonrenewable natural resources.

____

____

3. Name the four basic components of the physical environment.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

4. Select true statements concerning the history of natural resources. Place an "X" in the blanks next to the true statements.

______a. Humans have always conserved natural resources.

______b. Originally, resources were so abundant that there was no need to conserve them.

______c. With the increase in population, some natural resources have become scarce.

5. Explain the importance of natural resources.

____

____

____

Written Test

6. Give four examples of conflicts in natural resource management.

   a. ______________________________

   ____

   b. ______________________________

   ____

   c. ______________________________

   ____

   d. ______________________________

   ____

7. List four factors which affect natural resources.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

8. Distinguish between preservation and conservation of natural resources by placing an "X" next to the definition of preservation.

   ______a. Promotes the use of natural resources in a manner which minimizes waste and maintains that resource for future use

   ______b. Provides for the use of enjoyment of wilderness areas while leaving them unaltered for future generations

9. List five preservation activities.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

   e. ______________________________

Written Test

10. List two activities to conserve each of the following natural resources.

    a. Air conservation

        1) ____________________

        2) ____________________

    b. Water conservation

        1) ____________________

        2) ____________________

    c. Soil conservation

        1) ____________________

        2) ____________________

    d. Energy conservation

        1) ____________________

        2) ____________________

11. Match categories of solid waste with the descriptions. Write the corresponding numbers on the blanks provided.

______a. Waste from stores, offices, and other activities that do not actually turn out a product

______b. Waste that usually originates in homes

______c. Waste from educational, health care, and research facilities

______d. Solid waste from raising, slaughtering, and processing animal products and from orchards and field crops

______e. Residue from the manufacturing, handling, and use of chemicals designed to kill plant and animal pests

1. Agricultural
2. Commercial
3. Industrial
4. Institutional
5. Pesticide
6. Residential

Written Test

12. Select true statements concerning the composition of solid waste in a typical municipal landfill. Place an "X" in the blanks next to the true statements.

______a. The largest percentage of products in the municipal landfill is food waste.

______b. Yard waste make up the majority of items in a landfill.

______c. Glass makes up a small portion of items in a landfill.

______d. Paper products make up nearly half of the contents of a landfill.

13. Complete the following statements concerning methods of waste disposal. Write the correct number on the blank provided before each item.

______a. About ____________ of trash goes to landfills.

1) 10%
2) 50%
3) 80%

______b. Fewer landfills are being built because ____________ .

1) communities are running out of land for landfills
2) community groups oppose the landfill sites
3) landfills are no longer needed

______c. Improperly sited and maintained landfills contaminate ____________ .

1) air
2) wildlife
3) water

______d. Faulty incinerators create ____________ pollution and toxic ash by-products

1) air
2) water
3) land

______e. The advantage of incinerators is that they reduce the volume of refuse by ____________ .

1) 30%
2) 60%
3) 90%

______f. About ____________ of trash is recycled.

1) 10%
2) 50%
3) 80%

Written Test

14. Select true statements concerning waste reduction activities. Place an "X" in the blanks next to the true statements.

______a. Source reduction is eliminating waste before it happens.

______b. Recycling helps to reduce waste.

______c. Making goods more durable does little to reduce waste since they will be discarded sooner or later.

______d. A great deal of our waste can be recycled into new products.

15. Distinguish between recyclables and nonrecyclables by placing an "X" in the blanks next to the recyclables.

______a. Glass

______b. Aluminum

______c. Leaves, grass

______d. Waste heavily contaminated with food residue

______e. Plastics

______f. Wood

______g. Paper

______h. Composite materials

______i. Furniture

______j. Street sweepings

Written Test

16. Match federal agencies responsible for natural resources with their descriptions. Write the corresponding numbers on the blanks provided.

______a. Manage federal grasslands, prairie, desert, forest, and other open spaces of the nation's public lands

______b. Works to promote the welfare of the nation's Native Americans and their lands

______c. Works to develop water, land, energy resources, and other natural resources in the western United States

______d. Responsible for environmental impact of nation's network of military bases

______e. Administers programs with funding for agricultural conservation activities and administers farm programs

______f. Works to ensure efficient mining, processing, use, and recycling of mineral resources

______g. Helps protect the nation's birds, mammals, fish, and other wildlife

______h. Works to manage and protect forestland and grassland while promoting their best use

______i. Conducts surveys of the land and its resources and develops maps based on these surveys

______j. Determines environmental standards and enforces federal environmental laws

______k. Responsible for environmental integrity of federal lands along navigable public waterways

______l. Helps prevent soil erosion from wind and water

______m. Manages more than 300 areas within the national parks system

1. Agricultural Stabilization and Conservation Service
2. Bureau of Indian Affairs
3. Bureau of Land Management
4. Bureau of Mines
5. Bureau of Reclamation
6. Department of Defense
7. Department of Energy
8. Environmental Protection Agency
9. Fish and Wildlife Service
10. Forest Service
11. National Park Service
12. Natural Resources Conservation Service
13. U.S. Army Corps of Engineers
14. U.S. Geologic Survey

Written Test

17. List five types of occupations in natural resources.

    a. ____________________

    b. ____________________

    c. ____________________

    d. ____________________

    e. ____________________

18. List three ways of getting a job in natural resources.

    a. ____________________

    b. ____________________

    c. ____________________

19. List three characteristics of a person working in natural resources.

    a. ____________________

    b. ____________________

    c. ____________________

***Permission to duplicate this test is granted.**

Natural Resources and Conservation
Unit 2

Unit Evaluation Form

Student Name ______________________________ Unit Rating ____________

Assignment Sheet Ratings

Assignment Sheet 1—Report on a Local Natural Resource Problem Rating ______

Comments: ____

____

Assignment Sheet 2—Report on a Current Event Affecting Natural Resources Rating ______

Comments: ____

____

Assignment Sheet 3—Identify Recycling Centers in Your Area Rating ______

Comments: ____

____

Assignment Sheet 4—Identify Occupations in Natural Resources in Your Area Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Trace Route of Recyclable Products Rating ______

Comments: ____

____

Unit Evaluation Form

Assignment Sheet 2A—Complete a Class Community Service Project Rating ______

Comments: ______

______

Assignment Sheet 3A—Analyze Current Reports Concerning Natural Resources and Conservation Conflict Areas Rating ______

Comments: ______

______

Job Sheet Rating

Job Sheet 1A—Build and Use a Composting Site Rating ______

Comments: ______

______

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ______

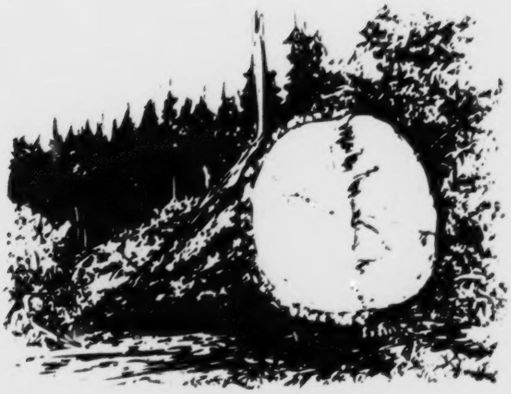
______

Teacher Signature ______ Date ______

Student Signature ______ Date ______

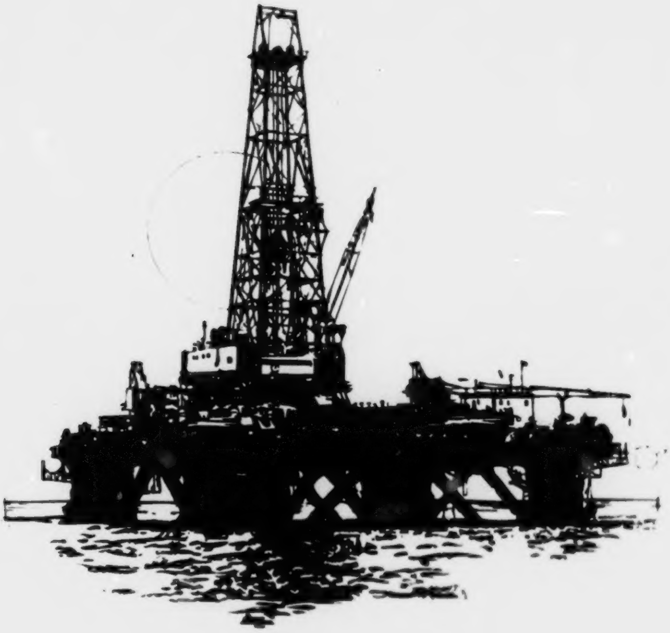
***Permission to duplicate this form is granted.**

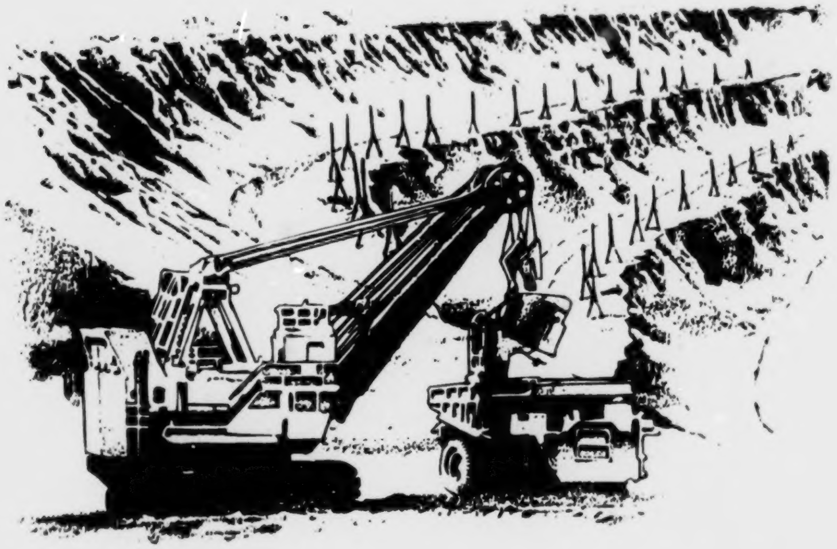
Renewable Natural Resources



TM 1

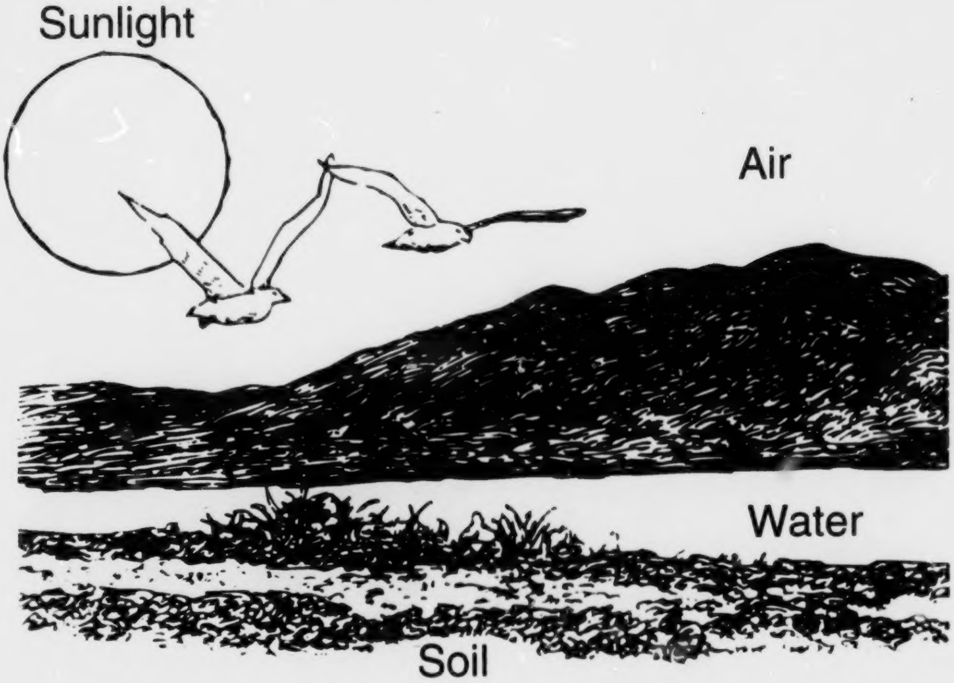
Nonrenewable Natural Resources





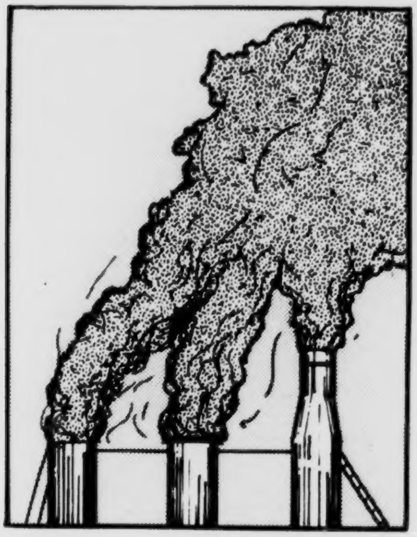
TM 2

Basic Components of the Physical Environment



TM 3

Types of Pollution



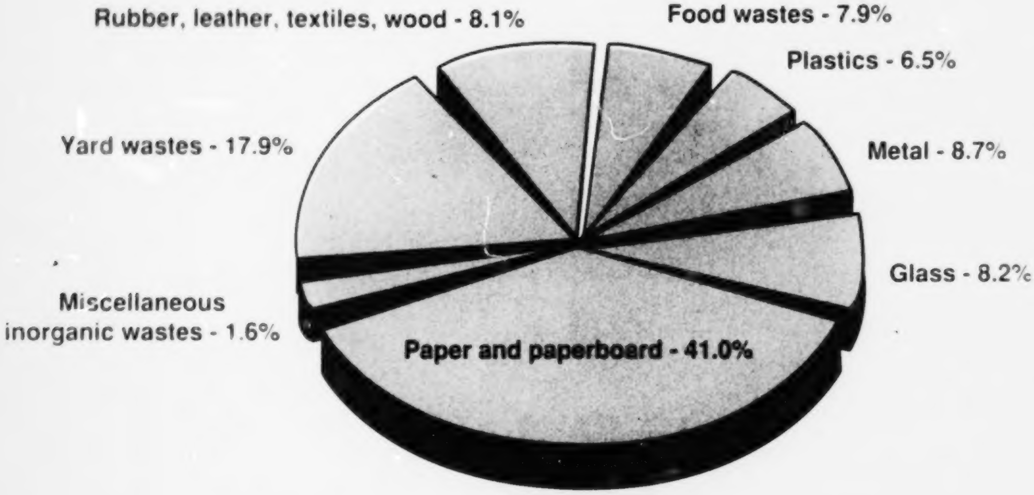
Air Pollution

Land Pollution

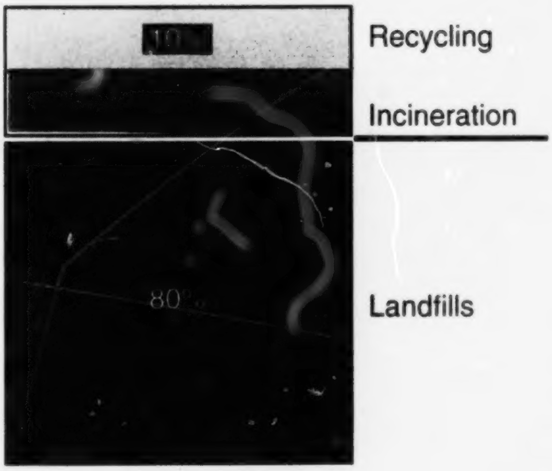
Water Pollution

TM 4

Composition of Solid Waste



Composition of Municipal Waste in a Typical Landfill



How U.S. Disposes of Its Solid Waste

Water Resource Management
Unit 3

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain various resources such as films, videotapes, water test kits, laboratory equipment, and other material to supplement instruction of this unit.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Hydrologic (Water) Cycle (Objective 5)
  TM 2—Surface Water Contamination (Objective 6)
  TM 3—Ground Water Contamination (Objective 7)

- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignment sheets, and plan presentation.

  Advanced Student Supplements

  1A—Maximum Contaminant Levels and Lifetime Health Advisories
  2A—Water Facts
  3A—Water Conservation Methods for Household Activities

  Advanced Assignment Sheets

  1A—Calculate and Draw Conclusions From Water Measurements

Suggested Activities

2A—Determine Ways to Reduce Home Water Consumption
3A—Research EPA "Superfund" Sites in Your State
4A—Analyze Current Reports Concerning Water Resource Management

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.

- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.

- Discuss the assignment sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Invite a representative of the State Water Resource Board or a state or federal environmental agency to discuss water pollution problems in your area. Assign students to small teams to survey your community or county for sources of water pollution or for potential water pollution problems. See Assignment Sheet 1 in this unit. Have each team prepare a one to two page report on the information they gathered, and have them recommend possible solutions to the problems they identified. Then have the class compile their reports into one document. **(Speaking; listening; writing; acquiring scientific information; interpersonal relations; teamwork; problem solving)**

- Invite a representative of a municipal or rural water distribution system to address the class on the mechanics of providing clean, safe, economical water to thousands of customers on a daily basis. Provide students with an opportunity to prepare and ask questions concerning the water service to assist them in completing Assignment Sheet 2.

  Arrange a class field trip led by this representative to see the water distribution system in action. Assign class members a written report covering the overall operation of the water system studied with a creative component asking them to compare safety, cost, dependability, etc. of the local water system with that of people who depend upon a home well for drinking water. **(Speaking; listening; writing; critical thinking; acquiring and evaluating information)**

Suggested Activities

- Obtain inexpensive water test kits at local mass merchandisers (Walmart, Kmart, etc.) designed to test for chlorine, hardness, pH, nitrate/nitrite and iron presence in drinking water. These kits employ easy-to-use color-coded dip strips.

  Note: Such kits are available from Enzone, Inc., College Point, NY 11356. Their retail price is about $4 per kit.

  Many of the same retail outlets also stock Enzone test kits to determine lead levels in drinking water. The cost is roughly $13 per kit, and requires the sample be mailed to Enzone's College Point, NY laboratory.

  Additional centralized water testing services are available from Midwest Laboratories, 13611 "B" Street, Omaha, NE 68144-3693. Telephone the laboratory for cost estimates at (402) 334-7770.

  To keep costs controlled, provide several kits to teams of students in the class, and assign them various water sources to sample and test. Examples might include the water fountain in the school hall, a water hydrant at a local or state park, home water supplies, or water from a nearby stream. After samples have been tested, have students give an oral report to the class on their findings and why they think the findings are accurate or inaccurate. **(Acquiring scientific information; applying scientific techniques; teamwork; critical thinking; speaking; listening)**

- Discuss water conservation and use and assign class members a project in which they survey water-wasting appliances and techniques during a week of observation. Also have them visit hardware and home improvement stores to report on water-saving devices and repair kits available in your local area. Have students report their findings to the class. **(Speaking; listening; critical thinking; teamwork; acquiring information)**

- Invite a representative of the local USDA Natural Resource Conservation Service (formerly the Soil Conservation Service) to discuss the "Know Your Watershed" project. Use topographical maps of the local area for the class members to designate the watershed in which their school lies. **(Listening; acquiring and applying scientific knowledge)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.

- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet, and the component "Answers to Assignment Sheets."

Suggested Activities

- Give and evaluate written test.
- Compile written-test and assignment-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- Camp, William G. and Thomas B. Daugherty. *Managing Our Natural Resources.* Albany, NY: Delmar Publishers Inc., 1988.
- Moran, Joseph M., et.al. *Introduction to Environmental Science.* New York: W. H. Freeman and Company, 1980.
- Newport, Bob D. *Salt Water Intrusion in the United States.* Springfield, VA: National Technical Information Service, 1987.
- Newport, Bob D. *State-of-the-Art: Sand and Gravel Industry in the United States.* Washington, D.C.: National Environmental Research Center, Office of Research and Development.
- Trieff, Norman M. *Environment and Health.* Ann Arbor, MI: Science Publishers, 1980.
- U.S. Environmental Protection Agency. *Environmental Progress and Challenges.* Washington, D.C.: Public Information Center, Office of Policy and Planning, 1988.
- U.S. Environmental Protection Agency. *Our Water Resources and Watershed Protection.* Washington, D.C.: Public Information Center, Office of Policy and Planning, 1993.
- U.S. Environmental Protection Agency. *The Problem of Nonpoint Source Pollution.* Washington, D.C.: Public Information Center, Office of Policy and Planning, 1993.
- *Water Quality: Self-Help Checklist.* Lincoln, NE: Nebraska Farm Bureau Federation, Public Affairs Department, 1989.

Suggested Activities

Supplemental Resources

Print Media

- Books, pamphlets, videotapes, and visiting speakers related to water conservation and pollution control are available from each state's office of the USDA Natural Resources Conservation Service (formerly the Soil Conservation Service). Each state has NRCS offices whereby materials can be obtained.

Suggested Activities

NRCS State Office Telephone Numbers

State	Telephone
AL	205-887-4523
AK	907-271-2424
AZ	602-280-8778
AR	501-324-5414
CA	916-757-8241
CO	303-236-2889
CT	203-487-4062
DE	302-678-4178
FL	904-338-0175
GA	706-546-2273
HI	808-541-2651
ID	208-334-1084
IL	217-398-5273
IN	317-290-3222
IA	515-284-4262
KS	913-823-4570
KY	606-224-7366
LA	318-473-7762
ME	207-866-7241
MD	410-757-3079
MA	508-692-0790
MI	517-337-6701 x1223
MN	612-290-3677
MS	601-965-4337
MO	314-876-0911
MT	406-587-6842
NE	402-437-5328
NV	702-784-5288
NH	603-868-7581
NJ	908-246-1205 x162
NM	505-766-3277
NY	315-423-5498
NC	919-790-2884
ND	701-250-4768
OH	614-469-5987
OK	405-624-4393
OR	503-326-2755
PA	717-782-2290
PR	809-766-5206
RI	401-828-1300
SC	803-765-5402
SD	605-353-1783
TN	615-736-5490
TX	817-774-1228
UT	801-524-5050
VT	802-951-6795
VA	804-287-1681
WA	509-353-2336
WV	304-291-4611
WI	608-264-5569
WY	307-261-5350

Suggested Activities

- America's Clean Water Foundation, 750 First N.E., Suite 911, Washington, D.C. 20002, or call (202) 898-0902.
- Water conservation materials and publications concerning protection of underground water supplies is available from the High Plains Underground Water Conservation District #1, 2930 Avenue Q, Lubbock, TX 79405.

Water Resource Management
Unit 3

Answers to Assignment Sheets

Assignment Sheet 1—Survey Your Area to Identify Water Pollution Sources

Student performance should be evaluated according to criteria listed on the assignment sheet.

Assignment Sheet 2—Evaluate Your Source of Drinking Water

Student performance should be evaluated according to criteria listed on the assignment sheet.

Assignment Sheet 3—Calculate Water Measurements

Student performance should be evaluated according to criteria listed on the assignment sheet.

Assignment Sheet 4—Calculate the Cost of Water

1. 1665324
2. 1648661
3. Yes
4. .00385 cents per gallon
5. d
6. Evaluated according to criteria listed on the assignment sheet

Water Resource Management
Advanced Applications
Unit 3

Answers to Advanced Assignment Sheets

Assignment Sheet 1A—Calculate and Draw Conclusions From Water Measurements

1. 149,600 gallons

2. a. 5,984 gallons
   b. 109 55-gallon drums
   c. 35 Americans

3. No, because the levels indicated are one-third the maximum contaminant level set by the federal government as allowable. One would be concerned to know if levels were rising over a period of time, however.

4. No, because the level is considerably less than government allowances. Still, concern would be warranted about the source of pollution and whether the level is rising, steady, or falling in magnitude.

5. b

6. a. 1,000 times smaller
   b. 1,000,000 times smaller
   c. Answers will vary and should reflect cognitive grasp of principle

Assignment Sheet 2A—Determine Ways to Reduce Home Water Consumption

Student performance should be evaluated according to criteria listed on the assignment sheet.

Assignment Sheet 3A—Research EPA "Superfund" Sites in Your State

Student performance should be evaluated according to criteria listed on the assignment sheet.

Assignment Sheet 4A—Analyze Current Reports Concerning Water Resource Management

Student performance should be evaluated according to criteria listed on the assignment sheet.

Water Resource Management
Unit 3

Answers to Written Test

1.

a.	7	e.	2	i.	10	m.	16
b.	4	f.	1	j.	8	n.	18
c.	3	g.	13	k.	9	o.	17
d.	14	h.	12	l.	11	p.	15

2. b, c

3.
   a. 3
   b. 1
   c. 3
   d. 2
   e. 1

4. Any four of the following:

   - Domestic
   - Agricultural
   - Industrial
   - Business
   - Fish and wildlife habitats
   - Recreation

5.
   a. 4
   b. 3
   c. 4
   d. 2

6.
   a. Any two of the following: Streams, farm ponds, lakes, rivers, oceans, wetlands, swamps, and estuaries
   b. domestic consumption
   c. conserved

7. a, c, d, f, j

8. Description should include the fact that the quality and quantity of one affects the other.

9. b, d

10. c, d

11. a, b, g, h

Answers to Written Test

12.

a.	6	f.	11
b.	7	g.	8
c.	10	h.	9
d.	1	i.	5
e.	2	j.	4

13. b, c, e

14.

a.	2	e.	3
b.	5	f.	10
c.	7	g.	1
d.	8	h.	9

15. Any five of the following:

- Hydrologist
- Chemist
- Geohydrologist
- Soil scientist
- Environmental scientist
- Biologist
- Chemical engineer
- Sanitary engineer
- Agricultural engineer
- Chemical, physical, and biological technician

Water Resource Management
Unit 3

Written Test

Name ______________________ Date ______________ Score __________

1. Match terms related to water resource management with their definitions. Write the corresponding numbers on the blanks provided.

______a. Continuous circulation of water between the oceans, atmosphere, and the earth's surface

______b. Waste that poses a serious threat to human health, even at low concentrations

______c. Water which seeps through the earth's surface and into ground water aquifers

______d. Water visible on the earth's surface

______e. Water found beneath the earth's surface

______f. Sand, gravel, or rock formation found below the earth's surface which is saturated with water

______g. A waste treatment system used primarily in rural areas

______h. Pollution which can be traced to a point of discharge

______i. Pollution which enters the environment from a wide area

______j. Waste generated by industry

______k. Waste from cities, primarily sewage

______l. A chemical used to kill or control pests

______m. Water which is made chemically, biologically, or physically impure for use

______n. Water which has evaporated and is suspended in the air

______o. The total drainage area where water flows to a common point

______p. Cloudy appearance of water due to suspended sediment particles

1. Aquifer
2. Ground water
3. Ground water recharge
4. Hazardous/toxic waste
5. Hazardous waste site
6. Heavy metals
7. Hydrologic cycle
8. Industrial waste
9. Municipal waste
10. Nonpoint source pollution
11. Pesticide
12. Point source pollution
13. Septic system
14. Surface water
15. Turbidity
16. Water pollution
17. Watershed
18. Water vapor

Written Test

2. Select true statements concerning the history of the importance of water in the U.S.. Place an "X" in the blanks next to the true statements.

   ______a. Most organisms can survive without water.

   ______b. As the United States was settled, the availability of water was of prime concern.

   ______c. Major population centers are located near major waterways.

   ______d. Industry does not require water.

   ______e. In general, water was not an important natural resource.

3. Complete statements concerning water distribution. Write the correct number on the blank provided before each item.

   ______a. Water covers about ________________ percent of the earth's surface.

   1) 50
   2) 60
   3) 70

   ______b. About ________________ percent of the surface water is salt water.

   1) 97
   2) 67
   3) 47

   ______c. ________________ percent of fresh water is contained in underground reservoirs.

   1) 25
   2) 47
   3) 97

   ______d. Only ________________ percent of fresh water in the U.S. exists in streams and lakes.

   1) 5
   2) 3
   3) 2

   ______e. The volume of ground water that is economically recoverable in the U.S. is equal to ________________ times the volume of the Great Lakes.

   1) 9
   2) 6
   3) 3

Written Test

4. List four uses of water.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

5. Complete statements concerning the hydrologic (water) cycle. Write the correct number on the blank provided before each item.

   ______a. Water exists in various forms. They are ______________

   1) Liquid and solid
   2) Solid, vapor, and gas
   3) Vapor and liquid
   4) Liquid, solid, and vapor

   ______b. The total volume of water on earth ______________

   1) Changes when it rains
   2) Varies according to average annual rainfall
   3) Remains constant
   4) Is less during a long drought

   ______c. The hydrologic cycle is ______________

   1) Water which accumulates after a rain
   2) A whirlpool caused by rotating water
   3) A vehicle which runs on water
   4) Water continuously moving between oceans, atmosphere, and the earth's surface

   ______d. Water supplies lost to evaporation, runoff, and human use ______________

   1) Cannot be replaced
   2) Are restored by the hydrologic cycle
   3) Are insignificant because there is an abundance of water
   4) Are replaced by drilling of water wells

6. Complete statements concerning surface water by filling in the blanks with the correct words.

   a. Two examples of surface water are ______________ and ______________.

   b. Surface water must be treated before it can be used for ______________ and industrial processes.

   c. Since quantities of surface waters are limited, their use must be ______________.

Written Test

7. Select true statements concerning ground water. Place an "X" in the blanks next to the true statements.

______a. Ground water is water which is found below the earth's surface.

______b. Ground water exists as lakes and rivers underground.

______c. Half of all Americans and 95% of rural Americans use ground water for drinking water.

______d. Ground water aquifers are sand, gravel, and rock formations.

______e. All ground water is located over 100 feet deep.

______f. Aquifers vary in thickness from a few feet to several hundred feet.

______g. Ground water moves rapidly from a mile to several miles per day.

______h. Ground water, protected by overlying soils, cannot be contaminated.

______i. Ground water resources are unlimited.

______j. Artesian wells are created when aquifer elevations are higher than the top of the well drilled into the aquifer.

8. Describe the relationship between ground water and surface water.

____

____

____

9. Select true statements concerning water pollution. Place an "X" in the blanks next to the true statements.

______a. Water pollution has caused serious epidemics such as rabies.

______b. Rural water wells are often contaminated by livestock and human waste.

______c. Pollution which can be traced to a point of discharge is called nonpoint source pollution.

______d. Today water is more likely to be chemically impure rather than biologically impure.

Written Test

10. Compare the state of the environment of 1960 and 1995. Place an "X" in the blanks next to the 1995 conditions.

______a. Surface waters are severely polluted.

______b. Fish and shellfish are unfit for human consumption.

______c. Waste discharges from industry are regulated and enforced.

______d. Funds have been provided from the cleanup of existing hazardous waste sites.

______e. Wetlands are considered unimportant and are not protected.

______f. Untreated sewage is dumped into streams and rivers.

11. Select true statements concerning hazardous/toxic waste. Place an "X" in the blanks next to the true statements.

______a. Improper hazardous waste disposal is a serious threat to water resources.

______b. Hazardous waste is generated by petrochemical plants, fertilizer manufacturers, plastic manufacturers, and metal refineries.

______c. If hazardous waste is placed in dumps and covered with soil, it is safe.

______d. There are only 10 hazardous waste sites in the U.S.

______e. Municipal landfills pose no threat to the environment.

______f. Underground storage tanks are not an environmental problem.

______g. Chemicals in plastics, solvents, pesticides, paints, and dyes are sources of hazardous waste.

______h. Health problems associated with hazardous waste contamination include cancer, brain and nerve damage, and birth defects.

Written Test

12. Match federal legislation for environmental protection of water resources with their intended purposes. Write the corresponding numbers on the blanks provided.

______a. Sets safe limits on chemicals in drinking water

______b. Regulates transport of hazardous materials

______c. Provides funds for cleanup of toxic waste dump sites

______d. Requires environmental impact statements for all projects affecting the environment

______e. Regulates discharges from industry and sewage treatment plants

______f. Continues support for sewage treatment plants, initiates new programs to control nonpoint pollution sources, and imposes tighter controls on toxic pollutants

______g. Regulates the treatment, storage, and disposal of hazardous waste

______h. Regulates use of dangerous chemical substances

______i. Classifies pesticides and regulates their use

______j. Regulates oil transport

1. 1970 National Environmental Policy Act
2. 1972 Clean Water Act
3. 1972 Marine Protection Research and Sanctuaries Act
4. 1972 Ports and Waterways Safety Act
5. 1972 Insecticide, Fungicide, and Rodenticide Act
6. 1974 Safe Drinking Water Act
7. 1974 Hazardous Materials Transportation Act
8. 1976 Resource Conservation and Recovery Act
9. 1976 Toxic Substances Control Act
10. 1980 Comprehensive Response Liability Act ("Superfund")
11. 1987 Water Quality Act

13. Select true statements concerning watersheds. Place an "X" in the blanks next to the true statements.

______a. A watershed is where the water starts (source).

______b. Watersheds vary in size.

______c. Water collected in watersheds is carried away by streams or seeps into aquifers.

______d. Land areas where surface water enters ground water aquifers are called springs.

______e. Water pollution is generally caused by human activities on land within the watershed.

Written Test

14. Match water measurement terms with their definitions or equivalents. Write the corresponding numbers on the blanks provided.

______a. 7.48 gallons
______b. Gallons per minute
______c. 1000 milliliters
______d. 1/1000 of a liter
______e. Cubic feet per second
______f. 1 part contaminant per 1 million parts water
______g. 1 foot of water covering one acre
______h. 1 part contaminant per 1 billion parts water

1. Acre foot
2. Cubic feet
3. Cu.ft./sec.
4. Gallon
5. GPM
6. Kiloliter
7. Liter
8. Milliliter
9. Parts per billion
10. Parts per million

15. List five career opportunities in water resource management.

a. ____
b. ____
c. ____
d. ____
e. ____

***Permission to duplicate this test is granted.**

Water Resource Management
Unit 3

Unit Evaluation Form

Student Name ______________________________ Unit Rating ____________

Assignment Sheet Ratings

Assignment Sheet 1—Survey Your Area to Identify Water Pollution Sources Rating ______

Comments: ____

____

Assignment Sheet 2—Evaluate Your Source of Drinking Water Rating ______

Comments: ____

____

Assignment Sheet 3—Calculate Water Measurements Rating ______

Comments: ____

____

Assignment Sheet 4—Calculate the Cost of Water Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Calculate and Draw Conclusions From Water Measurements Rating ______

Comments: ____

____

Assignment Sheet 2A—Determine Ways to Reduce Home Water Consumption Rating ______

Comments: ____

____

Unit Evaluation Form

Assignment Sheet 3A—Research EPA "Superfund" Sites in Your State Rating ______

Comments: ____

____

Assignment Sheet 4A—Analyze Current Reports Concerning Water Resource Management Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

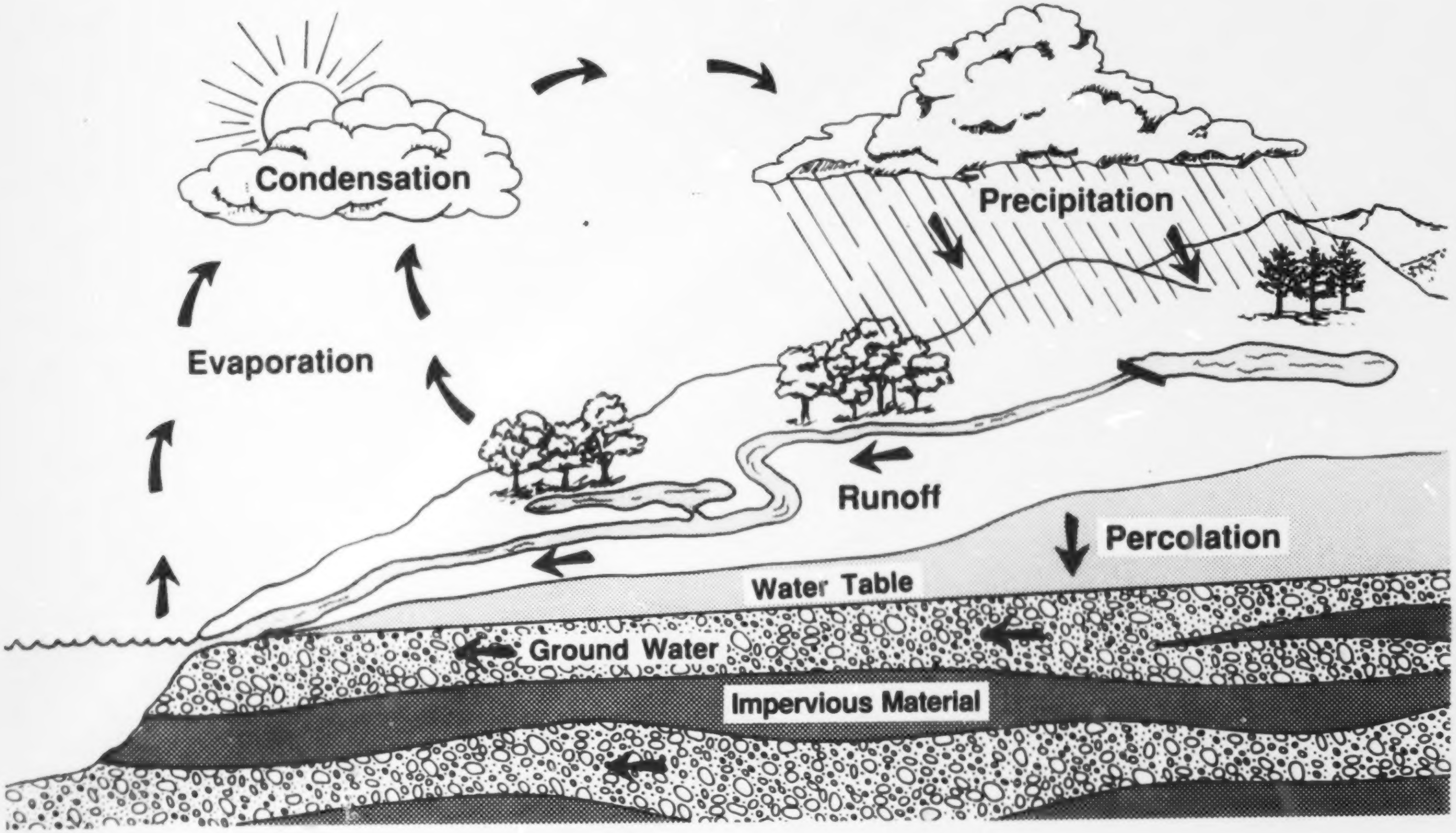
____

Teacher Signature ______________________________ Date ______________

Student Signature ______________________________ Date ______________

***Permission to duplicate this form is granted.**

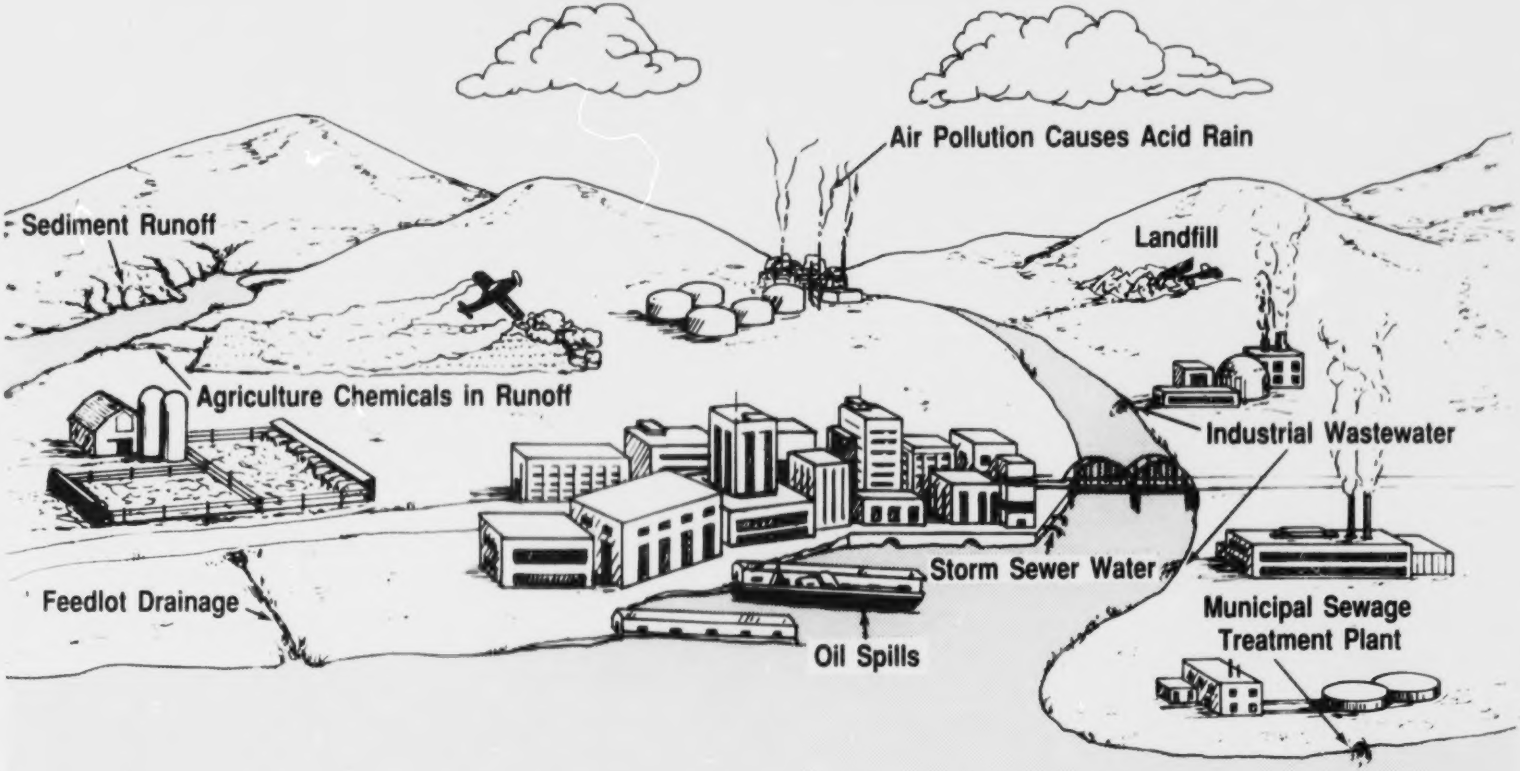
Hydrologic (Water) Cycle



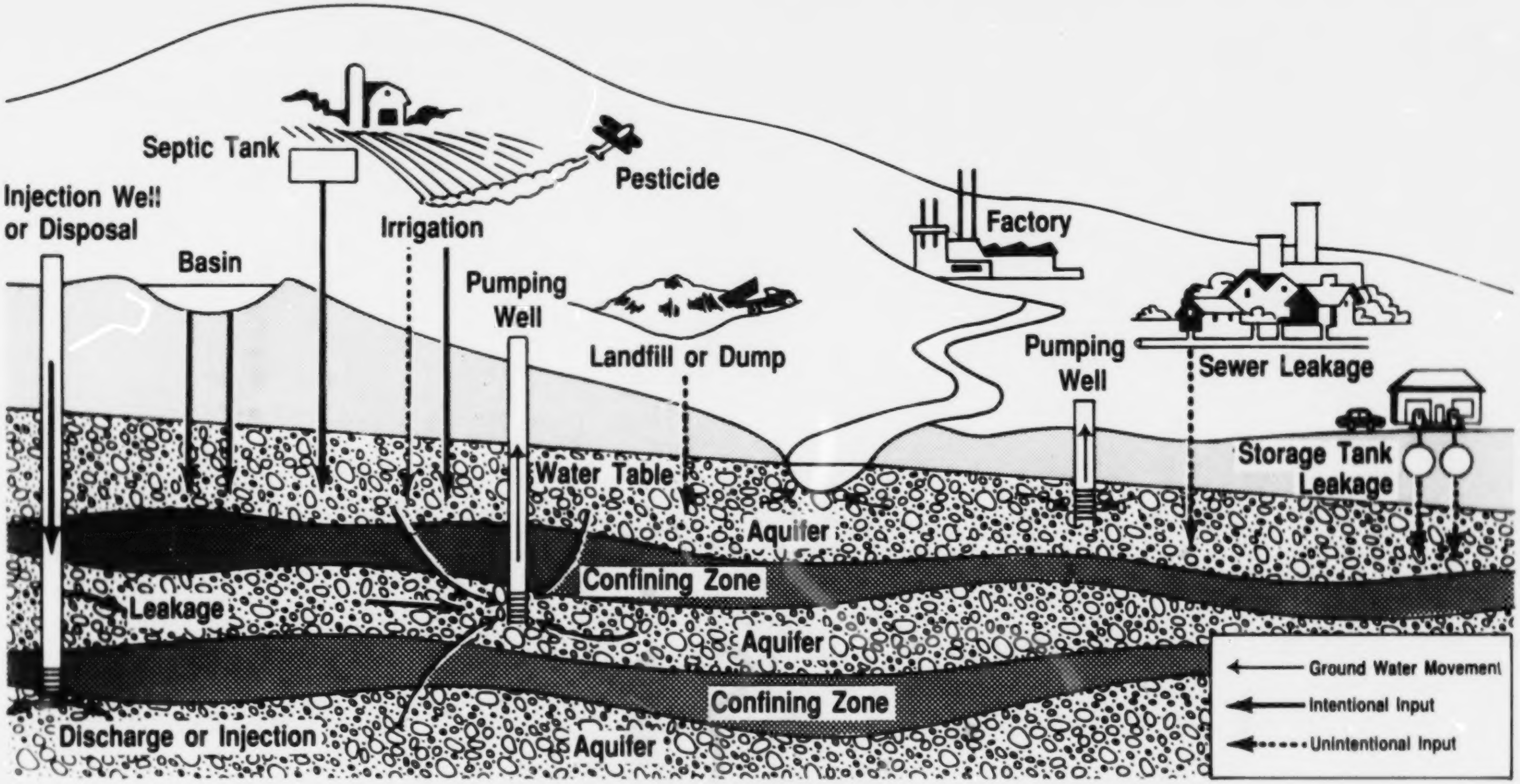
Introduction to Natural Resources, Unit 3
Teacher Page 25

TM 1

Surface Water Contamination


Air Pollution Causes Acid Rain
Sediment Runoff
Landfill
Agriculture Chemicals in Runoff
Industrial Wastewater
Storm Sewer Water
Feedlot Drainage
Municipal Sewage Treatment Plant
Oil Spills

Ground Water Contamination



BEST COPY AVAILABLE

Land Management
Unit 4

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Soil Textures and Their Particles (Objective 6)
  TM 2—Soil Profile (Objective 9)
  TM 3—Controlling Erosion on Farmlands (Objective 19)
  TM 4—Controlling Erosion Along Riverbanks (Objective 20)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements, assignment sheets, and job sheet, and plan presentation.

  Advanced Student Supplements

  1A—Fertilizer Analysis
  2A—Soil Drainage Suitability for Septic Systems
  3A—GIS: An Explanation
  4A—GPS for Agriculture: An Introduction to Differential Concepts

Suggested Activities

Advanced Assignment Sheets

1A—Determine Fertilizer Composition and Rates
2A—Report on GIS/GPS Technology and Utilization

Advanced Job Sheet

1A—Determine Suitability of a Site for a Septic System

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets and job sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Collect and distribute to the class various types of soil—sand, loam, clay, etc., explain the characteristics of each and accompany your presentation with slides of examples of each found in nature. Invite a geologist or geology teacher to address the class on soil formation and various types of soil erosion. Ask students to give examples of erosion found in your community and have them suggest ways it might be controlled. **(Acquiring scientific information; speaking; listening; applying scientific knowledge; critical thinking)**
- Invite a representative of the Natural Resources Conservation Service (formerly Soil Conservation Service) to address the class on soil types found in your locale using soil survey maps in use by the NRCS. Have students find their homes or other local landmarks and historical sites on the maps. **(Listening; acquiring scientific information; problem solving)**
- Invite your local land-grant university extension agent to demonstrate the proper techniques for taking soil samples and packaging them for shipping to the university's soils laboratory. Also, suggest the agent review a soil sample results report with the class and show how those results are quantified into recommendations for fertilizer

Suggested Activities

applications. Seek support from the agent for class members' individual or team soil samples called for in Job Sheet 1. This activity will also reinforce Assignment Sheet 1, Job Sheet 2, and Advanced Applications Assignment Sheet 1A. **(Listening; acquiring scientific information)**

- Arrange for students to do their own soil tests. The Redco Science Kit (What's In a Soil) called for in Job Sheet 2 is a relatively inexpensive kit ($5 to $7 each) available to schools in quantity. Other kits similar to the Redco kit may also be used, or the services of your state's land-grant university soil lab may be tapped for roughly the same amount.

  The Redco kit is available from:

  NASCO
  901 Janesville Avenue
  Box 901
  Fort Atkinson, WI

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.
- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.
- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate written test.
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Suggested Activities

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

  Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

  Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

  Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

  Option A

  4 - Skilled—Can perform job with no additional training.
  3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
  2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
  1 - Unskilled—Is familiar with process, but is unable to perform job.

  Option B

  Yes—Can perform job with no additional training.

  No—Is unable to perform job satisfactorily.

Suggested Resources

Resources Used in Developing This Unit

- Camp, William G. and Thomas B. Daugherty. *Managing Our Natural Resources.* Albany, NY: Delmar Publishers Inc., 1988.

- Cooperative Extension Service. *Soil Erosion By Water and Its Control.* North Dakota State University, Fargo, ND.

- Harp, Keith and Jim Steward. *Vocational Agriculture II.* Stillwater, OK: CIMC/Oklahoma Department of Vocational and Technical Education, 1986.

Suggested Activities

- Knuti, Leo L. *Profitable Soil Management*, 4th ed. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984.
- U.S. Department of Agriculture. Natural Resources Conservation Service. P.O. Box 2890, Washington, D.C. 20013-2890.
    - *Conserving Soil*
    - *Soil Erosion by Water*, Agricultural Information Bulletin 513.
    - *Soil Erosion by Wind*, Agricultural Information Bulletin 555.
    - *Farming and Maintaining Terraces*, Leaflet 570.
    - *Save Soil Systematically*, Program Aid 1366.
    - *Going Wild with Soil and Water Conservation*, Program Aid 1363.
    - *Tillage Options for Conservation Farmers*, Program Aid 1416.
    - *Sediment*, Agricultural Information Bulletin 325.

Supplemental Resources

Print Media

- Conservation Technology Information Center
  1220 Potter Dr., Rm. 170
  West Lafayette, IN 47906-1383

Non-print Media

- Hobar Publications
  1234 Tiller Lane
  St. Paul, MN 55112

  Computer software—Soil Evaluation, Fertility, and Related Review. For Apple and IBM. Has questions on soil profile, soil development, land capability, and land use.

- On American Soil. ©1985. 28 minutes 16mm or video. Produced by the Conservation Foundation. Discusses soil erosion in America today. Available from:

  Bull Frog Films, Inc.
  Oley, PA 19547
  (800) 543-FROG

Land Management
Unit 4

Answers to Assignment Sheets

Assignment Sheet 1—Read a Soil Test Report

1. 1

2. 79164

3. a. 44 d. 730
   b. 2.4 e. 7.6
   c. 8 f. Fine

4. a. High
   b. Low
   c. High
   d. Low

Assignment Sheet 2—Complete a Land Use Planning Summary

LAND USE PLANNING SUMMARY

Cooperator ______ Acres 285 CD ______

Assisted by ______ Date ______

Field	Acres	Land Use					Planned Practices
		Hay Land	Wild Life	Farm Stead	Range Land	Pasture Land	
1	37	37					
2	16	16					To Seed 1996
3	2			2			
4	47		47				Brush Control 1997
5	138				138		Cross Fence 1998
6	45					45	To Seed 1996
Total	285						

Assignment Sheet 3—Read a Soil Survey Map

1. a. CeB
   b. Rs
   c. CeA
   d. Bp

2. Southeast

3. CeA
4. Rs
5. CeA

Assignment Sheet 4—Read a Conservation Plan

1. Tillman
2. Mary Kellum
3. 46
4. Rangeland
5. III
6. To Seed
7. Cropland
8. Darold Hehn
9. 25
10. IV

Land Management
Unit 4

Answers to Advanced Assignment Sheets

Assignment Sheet 1A—Determine Fertilizer Composition and Rates

1. a. 18 percent N; 46 percent P; 0 percent K
   b. 33 percent N; 0 percent P and K
   c. 35 percent N; 10 percent P; 11 percent K
   d. 0 percent N and P; 24 percent K
   e. 10 percent N; 20 percent P; 10 percent K

2. a. 600 lbs. phosphorus
   b. 1640 lbs. nitrogen
   c. 0 lbs. sulfur
   d. 200 lbs. potassium
   e. 920 lbs. potassium

3. a. 1000 lbs. of 5-10-5 for a one-half acre park
   b. About 150 lbs. of 33-0-0
   c. $15
   d. $140
   e. $125

4. Evaluated to the satisfaction of the instructor

5. c

6. Evaluated to the satisfaction of the instructor

7. The 10-20-10 because it costs only $12 to accomplish the goal, whereas the 5-10-5 blend would cost $16

8. 200 lbs. of nitrogen

9. 50 lbs. of 10-20-10

Assignment Sheet 2A—Report on GIS/GPS Technology and Utilization

Student performance should be evaluated according to criteria listed on the assignment sheet.

Land Management
Unit 4

Answers to Written Test

1.
   - a. 4
   - b. 7
   - c. 10
   - d. 5
   - e. 11
   - f. 3
   - g. 13
   - h. 14
   - i. 12
   - j. 9
   - k. 15
   - l. 17
   - m. 16
   - n. 20

2.
   - a. rock
   - b. Weathering
   - c. types
   - d. plants
   - e. larger
   - f. Bacteria

3.
   - a. 1
   - b. 3
   - c. 2

4. Any three of the following:

   - Temperature changes
   - Winds
   - Water
   - Chemicals
   - Ice
   - Glaciers

5.
   - a. 2
   - b. 1
   - c. 3

6.
   - a. C
   - b. A
   - c. A
   - d. B
   - e. A
   - f. C

7. c

8. a, c, d, e, f

9.
   - a. Topsoil
   - b. Subsoil
   - c. Parent material

Answers to Written Test

10. a. 3
    b. 1
    c. 2

11. a, c

12. c, f, h

13. a. Nitrogen
    b. Phosphorus
    c. Potassium

14. b, c

15. a. Wind
    b. Water

16. Any four of the following:

    - Moving water
    - Topography including slopes
    - Lack of vegetation
    - Dry climate conditions
    - Wind
    - Human activities

17. a. Reduces
    b. Increases
    c. Increases
    d. Destroys
    e. Reduces
    f. Increases

18. a, b, c, e

19. Any four of the following:

    - Plant buffer strips of perennial grasses to hold soil particles.
    - Plant windbreaks to slow wind speeds.
    - Ridge soil into small furrows to trap soil particles.
    - Provide diversions to channel excess runoff.
    - Farm on the contour rather than straight-row.
    - Terrace to control and manage water runoff.
    - Use contour stripcropping.
    - Use rotation cropping.
    - Practice conservation tillage, which leaves all or a portion of the previous crop's residue on the soil surface after planting.
    - Use tile drainage to remove excess underground water.

Answers to Written Test

- Use grassed waterways to channel excess runoff.
- Mulch to hold soil in place.
- Prevent overgrazing of pastures and rangelands.
- Use field borders of perennial vegetation to protect field edges.

20. b, c, e, f

21. Any five of the following:

    - Private landowners
    - Land-grant colleges
    - Cooperative Extension Service
    - Agricultural experiment stations
    - High school agriculture education programs
    - Youth organizations — 4-H, FFA
    - Natural Resources Conservation Service
    - Forest Service
    - Bureau of Land Management
    - Bureau of Indian Affairs
    - Corps of Engineers
    - State and district soil and water conservation offices

22. a. 4
    b. 2
    c. 5
    d. 1

23. Any four of the following:

    - Soil map
    - Land use
    - Soil type and symbols
    - Acres
    - Capability class
    - Slope
    - Planned conservation treatment

24. a, c, d, f, g

25. Any two of the following:

    - Soil conservationist
    - Soil conservation technician
    - Soil scientist
    - Soil engineer
    - Range specialist
    - Range scientist
    - Wildlife conservationist
    - Ranch manager
    - Farmer

Land Management
Unit 4

Written Test

Name ______________________ Date ______________ Score __________

1. Match terms related to land management with their definitions. Write the corresponding numbers on the blanks provided.

______a. The wearing away of land surface

______b. Highly decomposed plant and animal residue that is a part of soil

______c. The planning and implementation of practices applied to the land

______d. An organic or inorganic material that is added to the soil to supply elements essential to plant growth

______e. A soil material that contains relatively equal amounts of sand, silt, and clay particles

______f. An imaginary line along the ground connecting all points of the same elevation

______g. The ability of the soil to allow air and water to move through it

______h. The actions that cause the breakdown of rock to form soil

______i. The downward movement of water into the soil

______j. The suitability of land for use without permanent damage

______k. The angle of the soil surface expressed as a percent of rise and fall

______l. The systematic examination, description, classification, and mapping of soils in an area

______m. The outer portion of the earth's crust that supports plant life

______n. A living barrier of trees and shrubs designed for protection from wind and/or snow

1. Bacteria
2. Compaction
3. Contour
4. Erosion
5. Fertilizer
6. Flood hazard
7. Humus
8. Inert material
9. Land capability class
10. Land management
11. Loam
12. Percolation
13. Permeability
14. Reclamation
15. Slope
16. Soil
17. Soil survey
18. Texture
19. Weathering
20. Windbreak

Written Test

2. Complete the following statements concerning how soils are formed by filling in the blanks. Choose from the following list (not all are needed):

   Acids, animals, bacteria, larger, plants, rock, smaller, types, weathering

   a. Soil starts out as ________________.

   b. ________________ factors work to break rocks down.

   c. Soil ________________ are based upon the kind of rock from which it is made.

   d. Small ________________ begin to grow within the rock particles.

   e. As more organic matter is formed, ________________ plant forms take root.

   f. ________________ and fungi break down the organic matter into simpler nutrients that are released into the soil.

3. Match types of rocks with their definitions. Write the corresponding numbers on the blanks provided.

   ______a. Formed by hardening of molten volcanic materials

   ______b. Formed as a result of changes in other rocks under heat and pressure

   ______c. Formed by a consolidation of particles laid down over the years

   1. Igneous
   2. Sedimentary
   3. Metamorphic

4. List three weathering factors.

   a. ____

   b. ____

   c. ____

5. Match types of soils with the ways they are deposited. Write the corresponding numbers on the blanks provided.

   ______a. Deposited by glaciers

   ______b. Deposited by moving fresh water

   ______c. Deposited by wind

   1. Alluvial soil
   2. Glacial soils
   3. Loess soils

Written Test

6. Distinguish among the major soil texture classes by placing the following letters next to the correct descriptions:

A — Sand
B — Silt
C — Clay

______a. A fine-textured soil

______b. A coarse-textured soil

______c. Grains can easily be seen and felt

______d. Feels smooth and talc-like when wet

______e. When dry, will fall apart

______f. Has low permeability rate

7. Select from the following list the composition of an average soil. Place an "X" in the blank next to the correct answer.

______a. Water 50%, air 10% organic matter 10%, mineral matter 30%

______b. Water 25%, air 50%, organic matter 10%, mineral matter 15%

______c. Water 25%, air 25%, organic matter 5%, mineral matter 45%

______d. Water 25%, air 25%, organic matter 25%, mineral matter 25%

8. Select from the following list the functions of organic matter. Place an "X" in the blanks next to the correct functions.

______a. Provides food for soil microorganisms

______b. Makes water in the soil

______c. Stores soil moisture

______d. Makes soil more tillable

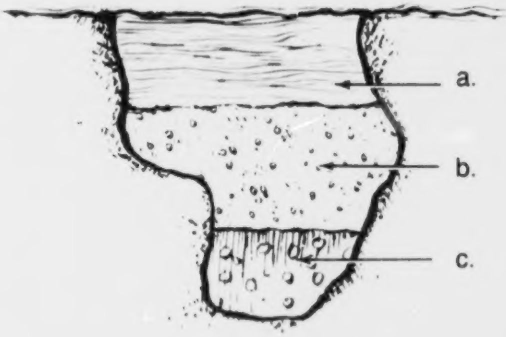
______e. Returns plant nutrients to the soil

______f. Serves as a cementing agent for soil particles

______g. Eliminates air in the soil

Written Test

9. Identify the three horizons of a soil profile.



a. ______________________________

b. ______________________________

c. ______________________________

10. Match land capability classes with their definitions. Write the corresponding numbers on the blanks provided.

______a. Soils suited only for recreation, wildlife, water supply, or aesthetic purposes

______b. Soils that can be used for cultivated crops but require proper land management

______c. Soils unsuited for cultivated crops and restricted largely to grazing, woodland, or wildlife

1. Class I-IV
2. Class V-VII
3. Class VIII

11. Select true statements concerning soil testing. Place an "X" in the blanks next to the true statement.

______a. Soils differ in the amount of nutrients they can supply to plants.

______b. A soil test will determine the exact amount of nutrients a soil can provide.

______c. Adding major plant nutrients based on a soil test can increase yield and will improve quality of the plant.

12. Distinguish between major and minor plant nutrients. Place an "X" in the blanks next to the major nutrients.

______a. Zinc

______b. Iron

______c. Potassium

______d. Sulfur

_______e. Chlorine

_______f. Nitrogen

_______g. Copper

_______h. Phosphorus

13. Identify the nutrients in the following fertilizer analysis:

10 — 20 — 10
↑ ↑ ↑
a. b. c.

a. ____________________

b. ____________________

c. ____________________

14. Select true statements concerning soil survey reports. Place an "X" in the blanks next to the true statements.

_______a. Soil survey reports contain aerial photograph maps for an entire state.

_______b. Soil survey reports give descriptions of soils in a county.

_______c. They list management information to assist in land use planning.

15. List the two types of erosion.

a. ____________________

b. ____________________

16. List four causes of erosion.

a. ____________________

b. ____________________

c. ____________________

d. ____________________

Written Test

17. Complete the following statements concerning the effects of erosion by circling the correct words.

    a. (Reduces) (Increases) fertility of land

    b. (Reduces) (Increases) sediment in reservoirs and ponds

    c. (Decreases) (Increases) water filtration expenses

    d. (Helps) (Destroys) spawning beds of game fish

    e. (Reduces) (Increases) fish food supply

    f. (Increases) (Decreases) the damage caused by floods

18. Select from the following list the contributors to erosion pollution. Place an "X" in the blanks next to the correct contributors.

    ______a. Riverbank erosion

    ______b. Farming erodible lands

    ______c. Unprotected construction sites

    ______d. Grassed waterway

    ______e. Industrial and mining activities

19. List four methods of controlling erosion on the farm.

    a. ____

    b. ____

    c. ____

    d. ____

20. Select from the following methods of controlling urban erosion. Place an "X" next to the correct methods.

    ______a. Create bare spots between vegetation to allow faster water absorption.

    ______b. Plant trees.

    ______c. Place rock materials along riverbank to secure it.

    ______d. Leave grass seed exposed on the soil while waiting for it to sprout.

______e. Disturb only the minimum of a construction area.

______f. Base all building plans on scientific soil surveys.

21. List five stewards of the soil.

a. ____

b. ____

c. ____

d. ____

e. ____

22. Match the Conservation Provisions of the historic 1985 Farm Bill with their descriptions. Write the corresponding numbers on the blanks provided.

______a. Discourages farmers from converting wetlands to croplands

______b. Required farmers to develop and begin actively applying an approved conservation plan for highly erodible cropland

______c. Discourages farmers from planting on new highly erodible land without a conservation plan

______d. Offers producers financial help in retiring highly erodible cropland

1. Conservation Reserve
2. Conservation Compliance
3. Cropbuster
4. Swampbuster
5. Sodbuster

23. List four parts of a conservation plan.

a. ____

b. ____

c. ____

d. ____

Written Test

24. Select true statements concerning reclamation of mined lands. Place an "X" in the blanks next to the true statements.

______a. Surface strip-mines are required to have a reclamation plan.

______b. Oxygen is a mineral resource obtained by surface mining.

______c. Surface mining can be harmful to land.

______d. Surface mining causes rivers and streams to become choked with sediment.

______e. As water drains through the mines, it becomes purified.

______f. To reclaim mined lands, earth-moving equipment is used to fill the mined area with rock debris, the land is shaped, topsoil is spread, and trees, shrubs, and a mixture of grass are planted.

______g. Sand and gravel are mined by surface mines.

25. List two career opportunities in land management.

a. ____

b. ____

***Permission to duplicate this test is granted.**

Land Management
Unit 4

Unit Evaluation Form

Student Name ______________________ Unit Rating __________

Assignment Sheet Ratings

Assignment Sheet 1—Read a Soil Test Report Rating ______

Comments: ______________________

____

Assignment Sheet 2—Complete a Land Use Planning Summary Rating ______

Comments: ______________________

____

Assignment Sheet 3—Read a Soil Survey Map Rating ______

Comments: ______________________

____

Assignment Sheet 4—Read a Conservation Plan Rating ______

Comments: ______________________

____

Job Sheet Ratings

Job Sheet 1—Take a Lawn and Garden Soil Sample Rating ______

Comments: ______________________

____

Job Sheet 2—Perform a Soil Test to Determine Organic Matter Rating ______

Comments: ______________________

____

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Unit Evaluation Form

Job Sheet 3—Determine Percent of Soil Particles Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Determine Fertilizer Composition and Rates Rating ______

Comments: ____

____

Assignment Sheet 2A—Report on GIS/GPS Technology and Utilization Rating ______

Comments: ____

____

Job Sheet Rating

Job Sheet 1A—Determine Suitability of a Site for a Septic System Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

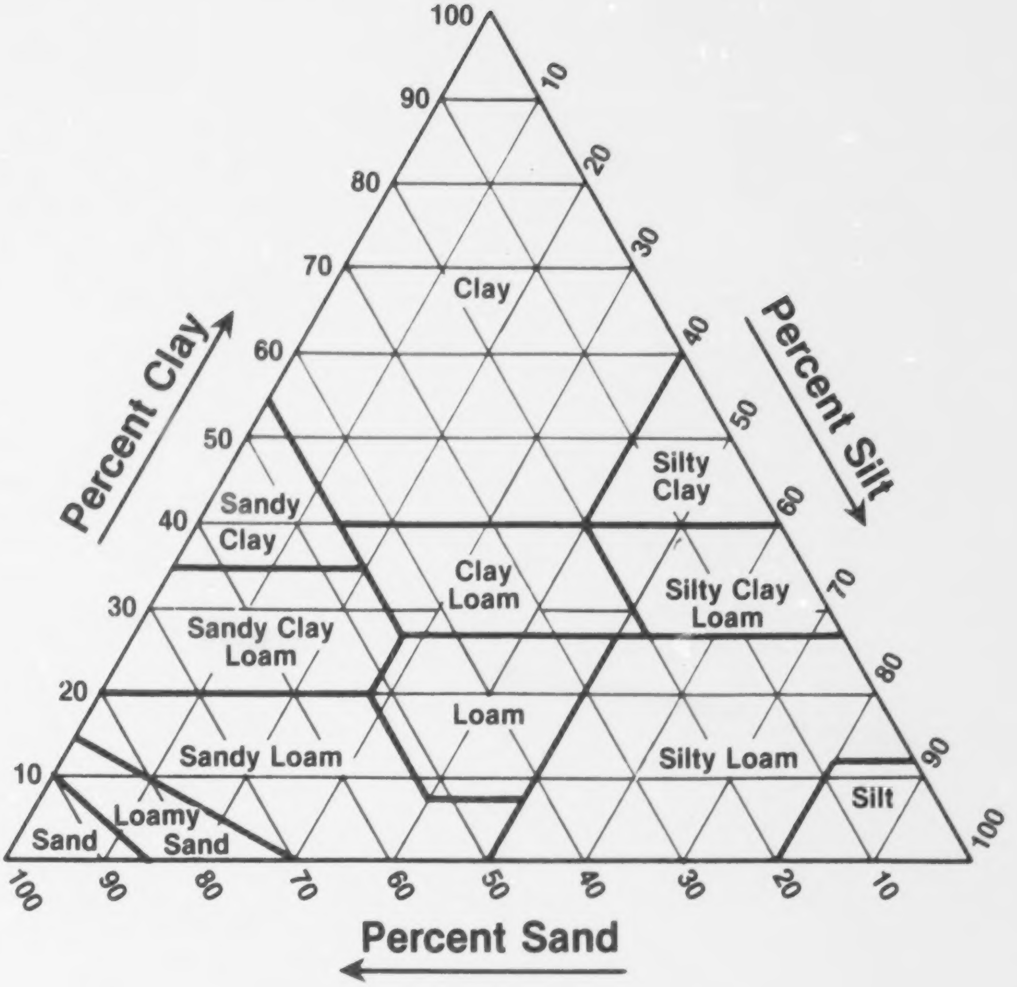
____

Teacher Signature ______________________________ Date ______________

Student Signature ______________________________ Date ______________

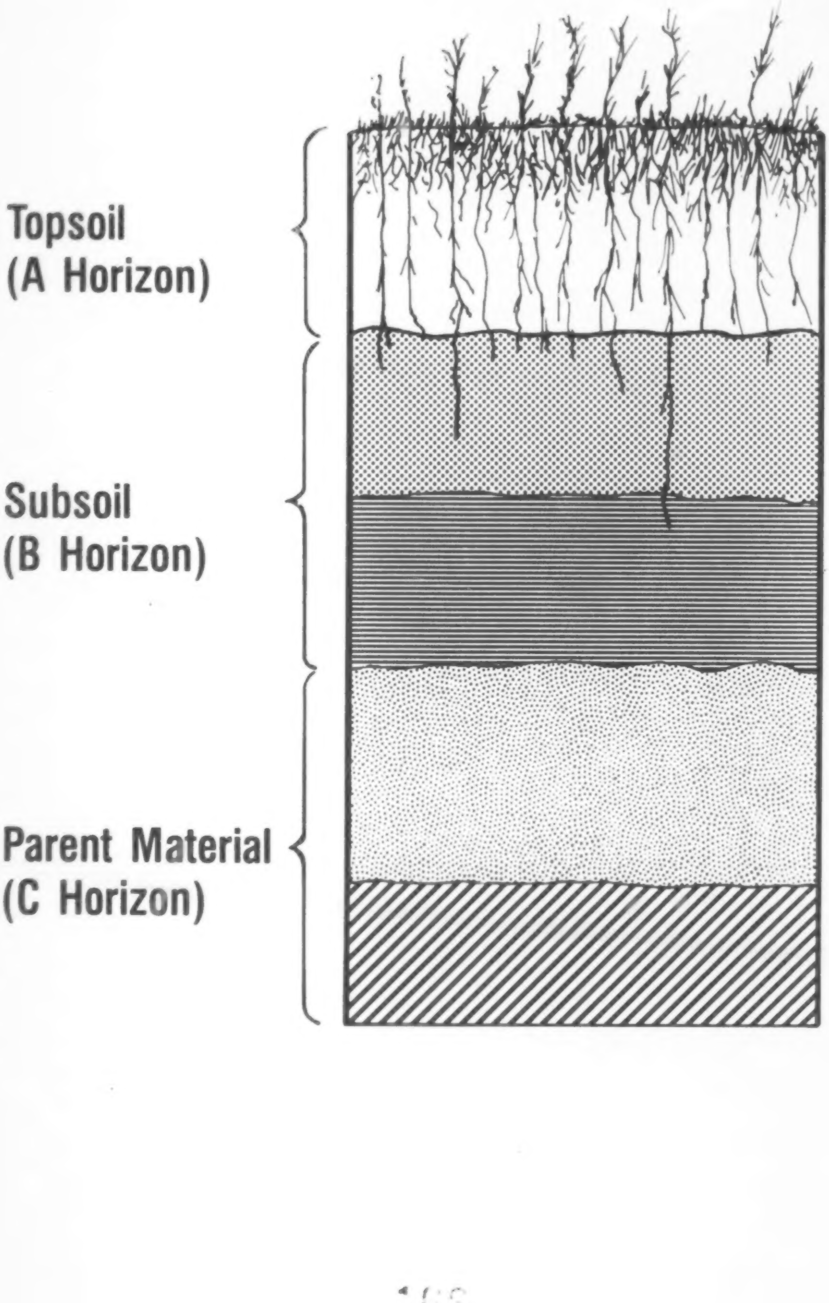
***Permission to duplicate this form is granted.**

Soil Textures and Their Particles

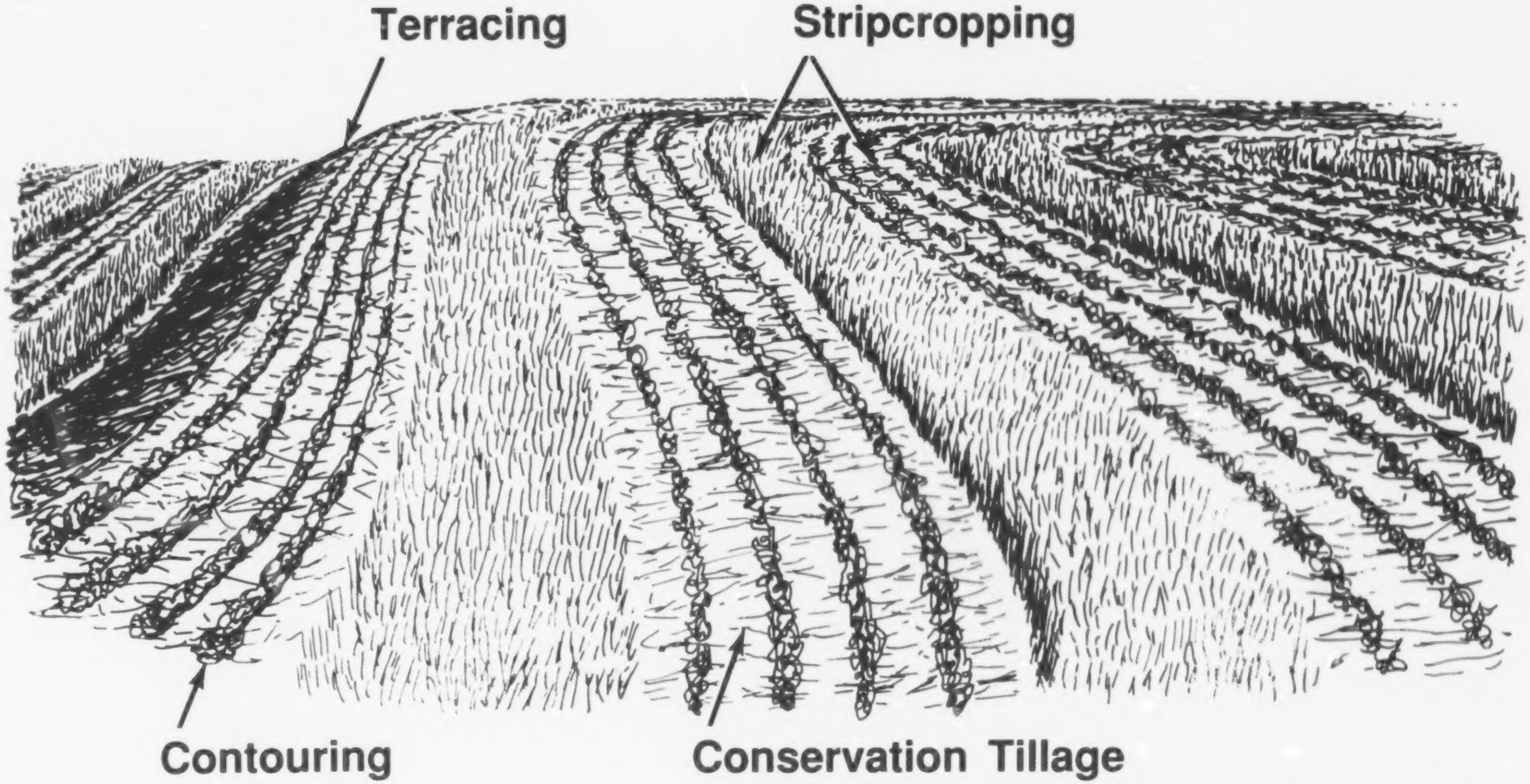


TM 1

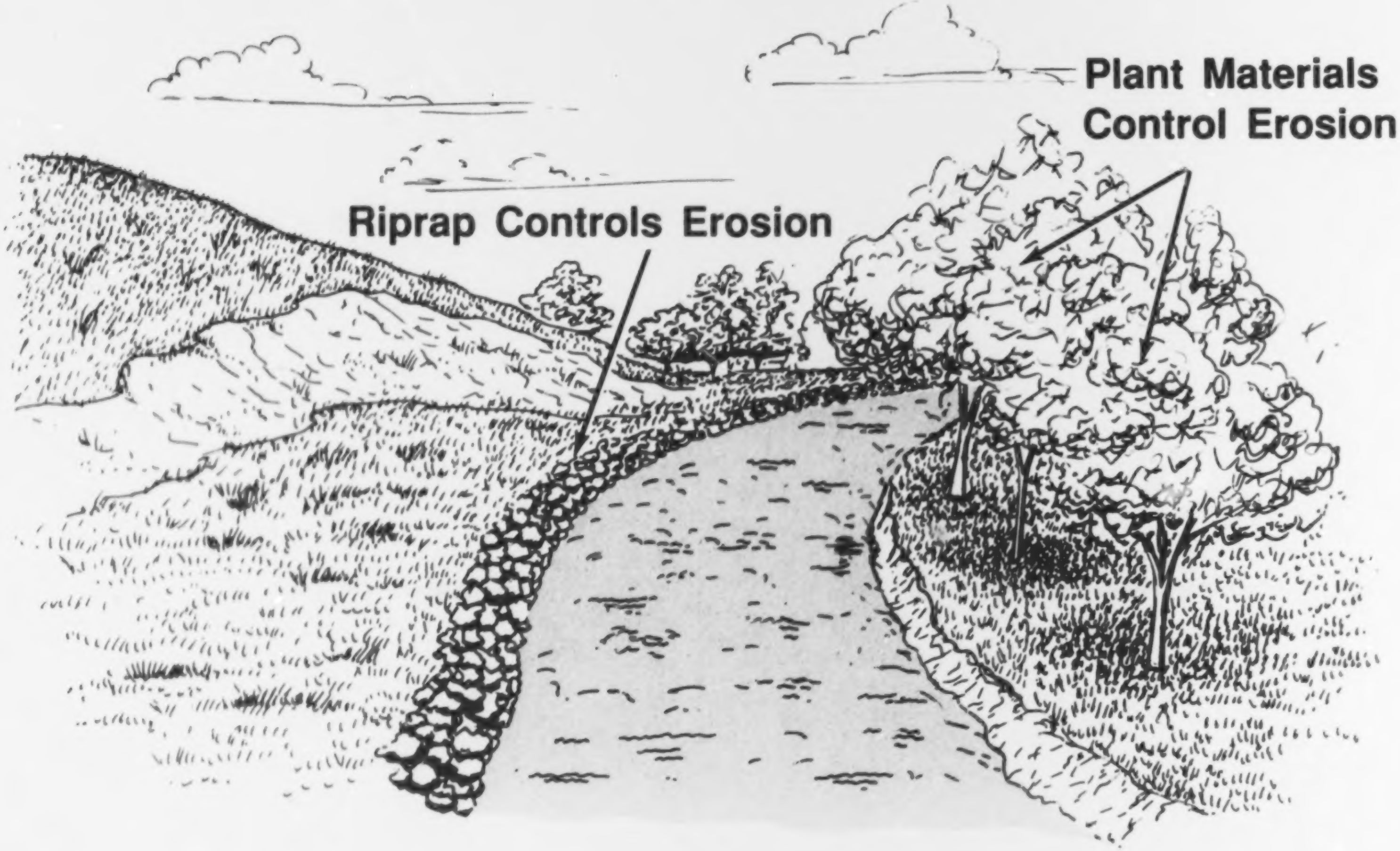
Soil Profile



Controlling Erosion on Farmlands



Controlling Erosion Along Riverbanks



Riprap Controls Erosion

Plant Materials Control Erosion

Air Resource Management
Unit 5

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Air Pollutants (Objective 3)
  TM 2—Greenhouse Effect (Objective 4)
  TM 3—Acid Rain (Objective 4)
  TM 4—Ozone Shield (Objective 4)
  TM 5—Smog (Objective 4)
  TM 6—Indoor Air Pollution (Objective 5)

- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignments, and plan presentation.

  Advanced Student Supplements

  1A—Understanding the Weather
  2A—Forecasting the Weather

Suggested Activities

Advanced Assignment Sheets

1A—Collect and Interpret Test Results From Air Monitoring Equipment
2A—Investigate the Contribution of Methane Gas to Global Warming
3A—Maintain a Weather Log for 21 Days
4A—Formulate Weather Forecasts
5A—Analyze Current Reports Concerning Federal Mandates to Combat Air Pollution From Auto Exhaust

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.

- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.

- Discuss the assignment sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- From a salvage yard or muffler shop, obtain a used catalytic converter plugged by improper use of leaded fuel, cut it open, and demonstrate it to the class. If possible, compare the plugged unit with a cross section of a new catalytic converter. **(Listening; oral communication; critical thinking)**

- Invite a mechanic to discuss with the class the effects of a plugged catalytic converter and why proper maintenance of modern emission equipment makes automobile operation more economical. **(Listening; oral communication; critical thinking)**

- Have a state health department employee bring to class and demonstrate air sampling equipment. This equipment is usually set up and left in place for several days; therefore, the students can use the equipment as part of Assignment Sheet 1A in the advanced supplement for this unit, to test for pollen, mold, and particulates. **(Listening; applying a scientific technique; critical thinking)**

Suggested Activities

- Invite industry and government officials to discuss with the class careers in air resource management. **(Listening; oral communication; career awareness)**

- Arrange for a test of the school facilities or student homes for the presence of radon gas. Contact state health department officials for more information.

- Arrange for the class to obtain access to an on-line computer service such as CompuServe, America-On-Line, or Data Transmission Network (DTN) to help them collect information for their reports on global environmental problems (Assignment Sheet 2). Also arrange for the class to use a computer service to observe the weather reports and colorful weather maps available. **(Utilizing technology; acquiring scientific data)**

- Obtain an aneroid barometer and windvane. Using advanced student supplements and assignment sheets discuss weather and forecasting. Assign each student a day to make visual weather observations, determine wind direction, and take barometric readings. Once these readings have been taken, the student should then give the class an oral weather report based on his or her personal findings and related forecast material from radio, television, and computer services. **(Acquiring scientific information; applying scientific techniques; utilizing technology; critical thinking; oral communication; problem solving; listening)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.

- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet.

- Give and evaluate written test.

- Compile written-test and assignment-sheet scores on the Unit Evaluation Form. Include any additional assignments.

- Measure competency gains by comparing written pretest scores with posttest scores.

- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.

Suggested Activities

- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- Camp, William G. and Thomas B. Daugherty. *Managing Our Natural Resources*. Albany, NY: Delmar Publishers Inc., 1988.
- Moran, Joseph M., et. al. *Introduction to Environmental Science*. W. H. Freeman and Company, 1980.
- Stein, Arthur C., et. al. *Fundamentals of Air Pollution*. New York: Academic Press.
- *Understanding the Greenhouse Effect and Global Climate Change*. American Coal Foundation, Washington, D.C., 20036.
- U.S. Environmental Protection Agency. *Environmental Progress and Challenges: EPA's Update*, 1988.
- U.S. Environmental Protection Agency. *EPA Journal*, Vol 12—"Acid Rain: Looking Ahead." Office of Public Affairs (A-107), Washington, D.C. 20460.
- U.S. Environmental Protection Agency, Office of Public Affairs. *National and Regional Trends in NAAQS Pollutants*. Washington, D.C. 20460
- U.S. Environmental Protection Agency, Office of Air and Radiation. *The Inside Story—A Guide to Indoor Air Quality*. Washington, D.C. 20460.

Supplemental Resources

Print Media

- American Petroleum Institute
  Public Affairs Dept.
  1220 L Street, N.W.
  Washington, D.C. 20005
- Global Climate Coalition
  1331 Pennsylvania Avenue, N.W.
  Suite 1500, North Lobby
  Washington, D.C. 20004-1703
- NASA Public Affairs
  400 Maryland Avenue, S.W.
  Suite 6043
  Washington, D.C. 20546

Suggested Activities

Non-print Media

- Films for the Humanities and Sciences
  P.O. Box 2053
  Princeton, NJ 08543
  (800) 257-5126

  - *Acid Rain*. 20 min., VHS or Beta. Provides chemical definitions and traces source of acid precipitation.

  - *Air Pollution: Outdoor*. 26 min., VHS or Beta. Examines air pollutants and research into new and cleaner fuels.

  - *Air Pollution: Indoor*. 26 min., VHS or Beta. Examines air pollutants in a home.

- International Film Bureau, Inc.
  332 South Michigan Ave.
  Chicago, IL 60604-4382
  (312) 427-4545

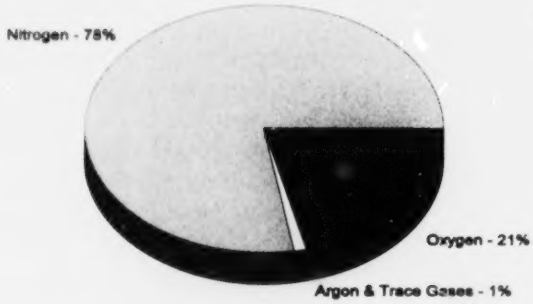
  - *Air is Life*. 15 min., 16 mm. or video. Air pollution is studied from a global perspective.

Air Resource Management
Unit 5

Answers to Written Test

1.	a.	4	e.	14	i.	15					
	b.	1	f.	8	j.	3					
	c.	7	g.	6	k.	5					
	d.	10	h.	2							

2.



3.	a.	4	d.	5
	b.	1	e.	2
	c.	3	f.	6

4.	a.	3	e.	1	i.	1	m.	4
	b.	4	f.	4	j.	2	n.	3
	c.	4	g.	4	k.	3	o.	1
	d.	4	h.	2	l.	3		

5. a, b, d

6.	a.	4
	b.	1
	c.	2
	d.	3
	e.	6

7. b

Answers to Written Test

8. Any four of the following:

   a. Reduce the escape of hydrocarbons from the fuel system.
   b. Keep engines tuned.
   c. Maintain emission control systems and catalytic converters.
   d. Use lead-free gasoline.
   e. Reduce sulfur compounds during refining of diesel fuel.
   f. Use ethanol (grain alcohol) as a fuel.
   g. Use methanol (wood alcohol) as a fuel.

9. Any three of the following:

   a. Install equipment (scrubbers) to remove air contaminants from stack exhaust.
   b. Remove pollutants from fuel source such as sulfur from coal.
   c. Use technologies which reduce contaminants in exhaust emissions.
   d. Use coal with low sulfur content.
   e. Convert operations to fuels which produce less air pollutants such as natural gas, solar, wind, and nuclear.

10. a. 98%
    b. decrease
    c. 30%
    d. coal-fired power plants
    e. decreased

11. Discussion should include that air pollution affects all countries. Pollutants generated in one country will cause problems in another country and worldwide. International cooperation is needed to control air pollution. Students may give specific examples.

12. Any three of the following:

    a. Meteorology
    b. Environmental science
    c. Air quality management
    d. Physics
    e. Air quality engineering
    f. Physical, chemical, and engineering technicians

Air Resource Management
Unit 5

Written Test

Name ______________________ Date ______________ Score __________

1. Match terms related to air resource management with their definitions. Write the corresponding numbers on the blanks provided.

______a. The mass of air surrounding the earth held by the force of gravity

______b. A mixture of invisible, odorless, tasteless gases that surround the earth

______c. Compounds composed of chemicals containing carbon

______d. Any introduced gas, liquid, or solid that makes a resource unfit for a specific purpose

______e. An air pollution control device that uses a liquid spray to remove pollutants from a gas stream; also lowers the temperature of the emission

______f. A scale which represents alkalinity or acidity

______g. The level of pollutants in the outside air that by law cannot be exceeded during a specified time in a specified geographical area

______h. Abnormally high concentrations of air pollutants

______i. Lack of wind in an air mass

______j. Any unconfined portion of the atmosphere; the outside air

______k. Pollutant discharged into the air

1. Air
2. Air pollution episode
3. Ambient air
4. Atmosphere
5. Emission
6. National ambient air quality standards
7. Organic compounds
8. pH
9. Polar ice caps
10. Pollutant
11. Pollution
12. Population density
13. Respiratory system
14. Scrubber
15. Stagnation

Written Test

2. Draw a pie chart depicting the composition and percentages of air components (unpolluted).

3. Match air pollutants with their characteristics and health hazards. Write the corresponding numbers on the blanks provided.

______a. A heavy, pungent, colorless gas formed primarily through the burning of coal, fuel oils, and wood

______b. Finely divided solid or liquid particles in the air or in an emission such as dust, smoke, and fumes

______c. Impairs ability of blood to carry oxygen; affects heart, lungs, and nervous system

______d. An invisible gas produced when oxygen in the air combines with nitric oxide that is produced by fossil fuel combustion, primarily in motor vehicles

______e. Serious respiratory problems such as breathing difficulties, asthma, reduced lung function, eye irritation, nasal congestion, and reduced resistance to infection

______f. Causes brain damage and serious physical and mental impairment, especially in children

1. Particulate matter
2. Ozone (O_3)
3. Carbon monoxide (CO)
4. Sulfur dioxide (SO_2)
5. Nitrogen dioxide (NO_2)
6. Lead (Pb) (Airborne)

4. Complete statements concerning the environmental effects of air pollution. Write the correct number on the blank provided before each item.

______a. The greenhouse effect ____________________

1) Is caused by the depletion of the ozone shield
2) Is caused by smog
3) Is caused by carbon dioxide trapping heat
4) Does not occur in winter

Written Test

______b. Global warming __________________

1) Would benefit everyone
2) Would cause sea levels to decrease due to evaporation
3) Would not affect the natural ecosystem
4) Would cause many agricultural areas to become nonproductive

______c. The greenhouse effect is caused by __________________

1) Natural decay of all vegetation
2) Burning of fossil fuels
3) Burning of rain forests
4) All of the above

______d. A solution to the problem of greenhouse effect is to __________________

1) Cut down trees which produce carbon dioxide
2) Burn more coal and oil
3) Move to the country
4) None of the above

______e. Acid rain __________________

1) Begins with the emission of sulfur dioxide and nitrogen dioxide
2) Is caused by ozone in the atmosphere
3) Is beneficial to streams and lakes
4) Can be eliminated by reducing lead in the atmosphere

______f. Acid rain __________________

1) Increases fish populations
2) Improves forests by killing pests
3) Improves agricultural practices
4) None of the above

______g. Acid rain can be reduced by __________________

1) Burning less coal
2) Reducing sulfur dioxide in automobile exhaust
3) Converting to cleaner fuels such as natural gas, nuclear, solar or wind
4) All of the above

______h. Acid rain __________________

1) Occurs only during the spring rains
2) Leaches metals from the soils and affects fish and aquatic plants
3) Is responsible for increased crop production
4) Kills harmful insects

Written Test

______i. The ozone shield is a layer of ozone in the stratosphere ________________

1) 6-30 miles above the earth
2) 30-100 miles above the earth
3) 1-2 miles above the earth
4) None of the above

______j. The depletion of the ozone shield is thought to be due to ________________

1) Acid rain
2) Attack by chlorofluorocarbons
3) Increase in particulates in the atmosphere
4) Global warming

______k. If the ozone layer is destroyed, ________________

1) Carbon dioxide levels would be reduced
2) The price of ozone would increase
3) Dangerous ultraviolet light will increase in intensity
4) Another one could be built, but it would be expensive

______l. Chlorofluorocarbons (CFCs) ________________

1) Are carbon compounds which preserve ozone destruction
2) Are manufactured and released to improve the air environment
3) Are compounds consisting of chlorine, fluorine, and carbon
4) Are good for the ozone layer

______m. Reduction of the ozone layer ________________

1) Will cause an increase in skin cancer
2) Will increase U.V. radiation striking the earth
3) Will decrease crop yields
4) All of the above

______n. Smog is generally found ________________

1) In rural areas
2) Downwind of feed lots
3) In densely populated areas
4) In unpopulated areas

______o. Smog is caused by ________________

1) Automobile exhaust
2) High winds
3) Chlorofluorocarbons
4) Sulfuric acid

Written Test

5. Select true statements concerning indoor air pollution. Place an "X" in the blanks next to the true statements.

______a. Indoor air quality is frequently worse than outdoor air.

______b. Most people spend 90% of their time indoors.

______c. New homes built to conserve energy usually do not have pollution problems.

______d. Eye, ear, nose, and throat problems may be caused by indoor air pollution.

______e. Indoor air pollution health problems are minor.

6. Match indoor air pollutants with their characteristics. Write the corresponding numbers on the blanks provided.

______a. Found in furniture, foam insulation, and pressed wood products

______b. Fibers are extremely small and become airborne when separated from parent material; can be inhaled or ingested; known to cause cancer

______c. Include pollen, mold, fungi, and viruses which can be brought indoors through heating and air conditioning systems and then multiply inside

______d. Contains heavy metals, particulates, and products of incomplete burning; causes 50-5,000 deaths per year

______e. Enters building through foundation cracks or seams; causes 5,000-20,000 deaths per year

1. Asbestos
2. Biological pollutants
3. Environmental tobacco smoke
4. Formaldehyde
5. Pesticides
6. Radon

7. Select true statements concerning air quality regulations. Place an "X" in the blanks next to the true statements.

______a. Air quality regulations only affect big industries.

______b. Regulations have helped to improve air quality in the United States.

______c. Air quality standards are only enforced by the federal government.

______d. Automobiles are exempt from air quality standards.

______e. Air quality standards do not exist in some states.

Written Test

8. List four methods of controlling motor vehicle emissions.

   a. ____________________

   b. ____________________

   c. ____________________

   d. ____________________

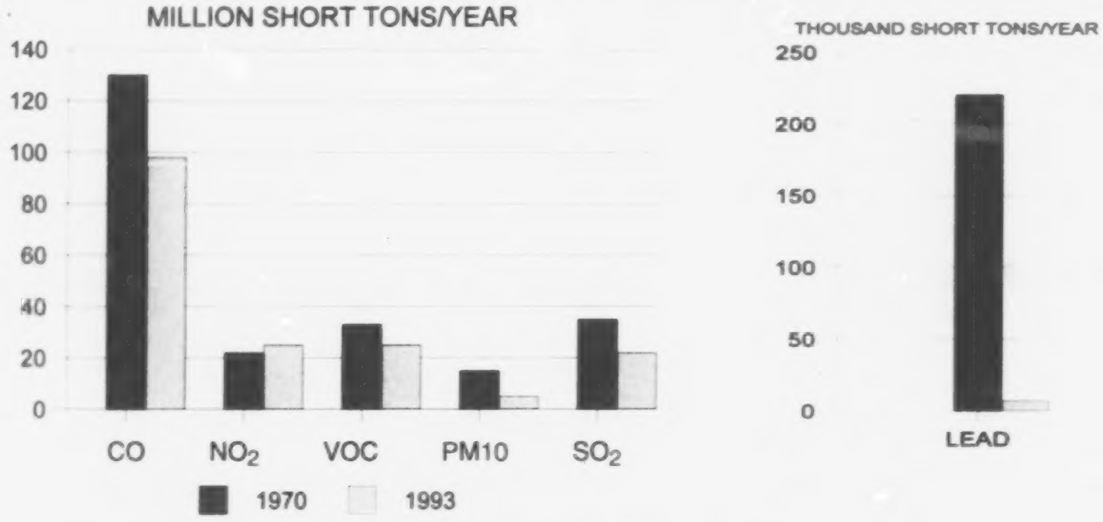
9. List three methods of controlling air pollution from industry and electrical power generating plants.

   a. ____________________

   b. ____________________

   c. ____________________

10. Read the accompanying graph on air quality trends in the United States, then circle or underline the correct answers to the questions that follow.



   a. Lead in the atmosphere has decreased (55%) (98%).

   b. Atmospheric lead is expected to (increase) (decrease) in the future.

   c. Sulfur dioxide levels have decreased (30%) (87%).

   d. Decrease in sulfur dioxide is primarily due to pollution control devices installed on (automobiles) (coal-fired power plants).

   e. Carbon monoxide levels have (increased) (decreased) 24%.

Written Test

11. Discuss global considerations in air resource management.

____

____

____

____

____

12. List three career opportunities in air resource management.

a. ____

b. ____

c. ____

***Permission to duplicate this test is granted.**

Air Resource Management
Unit 5

Unit Evaluation Form

Student Name ______________________________ Unit Rating ____________

Assignment Sheet Ratings

Assignment Sheet 1—Locate Sources of Air Pollution in Your Area Rating ______

Comments: ____

____

Assignment Sheet 2—Write a Report on a Global Environmental Problem Related to Air Quality Rating ______

Comments: ____

____

Assignment Sheet 3—Observe Particulate Matter Collected on a Petroleum Jelly Pad Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Collect and Report Results From Air Monitoring Equipment Rating ______

Comments: ____

____

Assignment Sheet 2A—Investigate the Contribution of Methane Gas to Global Warming Rating ______

Comments: ____

____

Unit Evaluation Form

Assignment Sheet 3A—Maintain a Weather Log for 21 Days Rating ______

Comments: ____

____

Assignment Sheet 4A—Formulate Weather Forecasts Rating ______

Comments: ____

____

Assignment Sheet 3A—Analyze Current Reports Concerning Federal Mandates to Combat Air Pollution From Auto Exhaust Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ______________________________________ Date ______________

Student Signature ______________________________________ Date ______________

***Permission to duplicate this form is granted.**

Air Pollutants

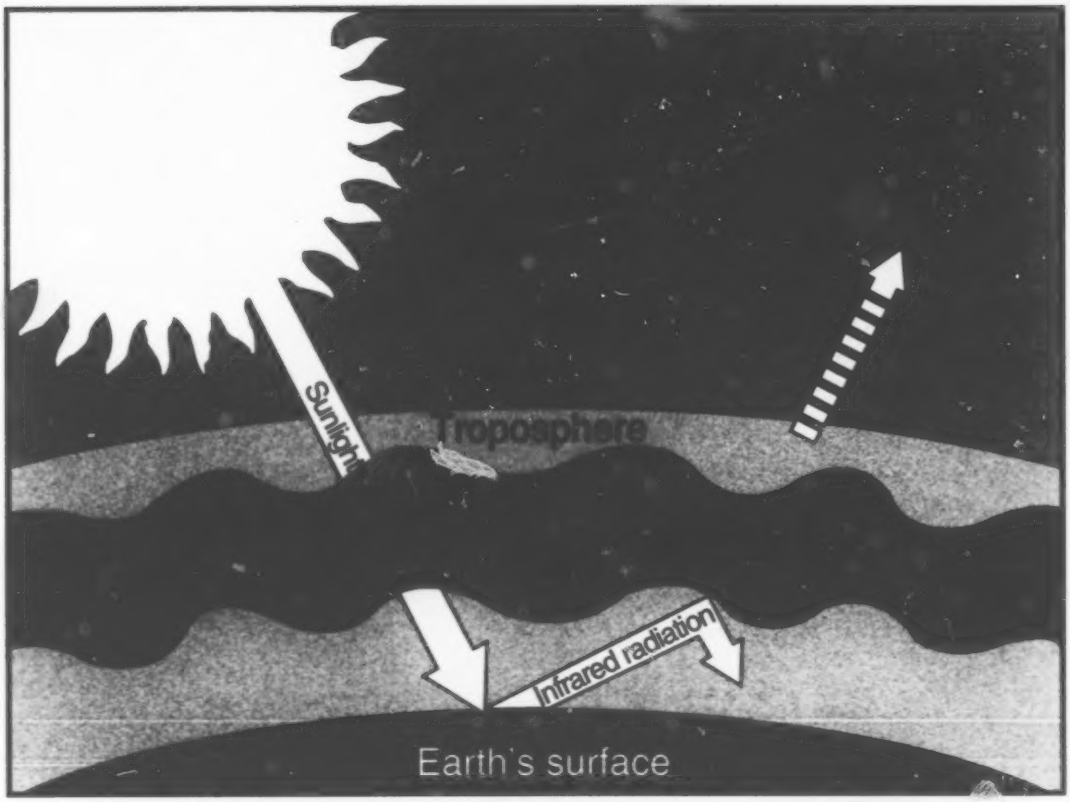
Health Effects of the Regulated Air Pollutants

Criteria Pollutants	Health Concerns
Ozone	Respiratory tract problems such as difficult breathing and reduced lung function. Asthma, eye irritation, nasal congestion, reduced resistance to infection, and possibly premature aging of lung tissue
Particulate Matter	Eye and throat irritation, bronchitis, lung damage, and impaired visibility
Carbon Monoxide	Ability of blood to carry oxygen impaired. Cardiovascular, nervous, and pulmonary systems affected
Sulfur Dioxide	Respiratory tract problems; permanent harm to lung tissue
Lead	Retardation and brain damage, especially in children
Nitrogen Dioxide	Respiratory illness and lung damage

Hazardous Air Pollutants	Health Concerns (no level is safe)
Asbestos	A variety of lung diseases, particularly lung cancer
Beryllium	Primarily lung disease, although also affects liver, spleen, kidneys, and lymph glands
Mercury	Several areas of the brain as well as the kidneys and bowels affected
Vinyl Chloride	Lung and liver cancer
Arsenic	Causes cancer
Radionuclides	Causes cancer
Benzene	Leukemia
Coke Oven Emissions	Respiratory cancer

Information provided by U.S. Environmental Protection Agency.

Greenhouse Effect



The Greenhouse Effect Traps Solar Heat

Courtesy of U.S. Environmental Protection Agency

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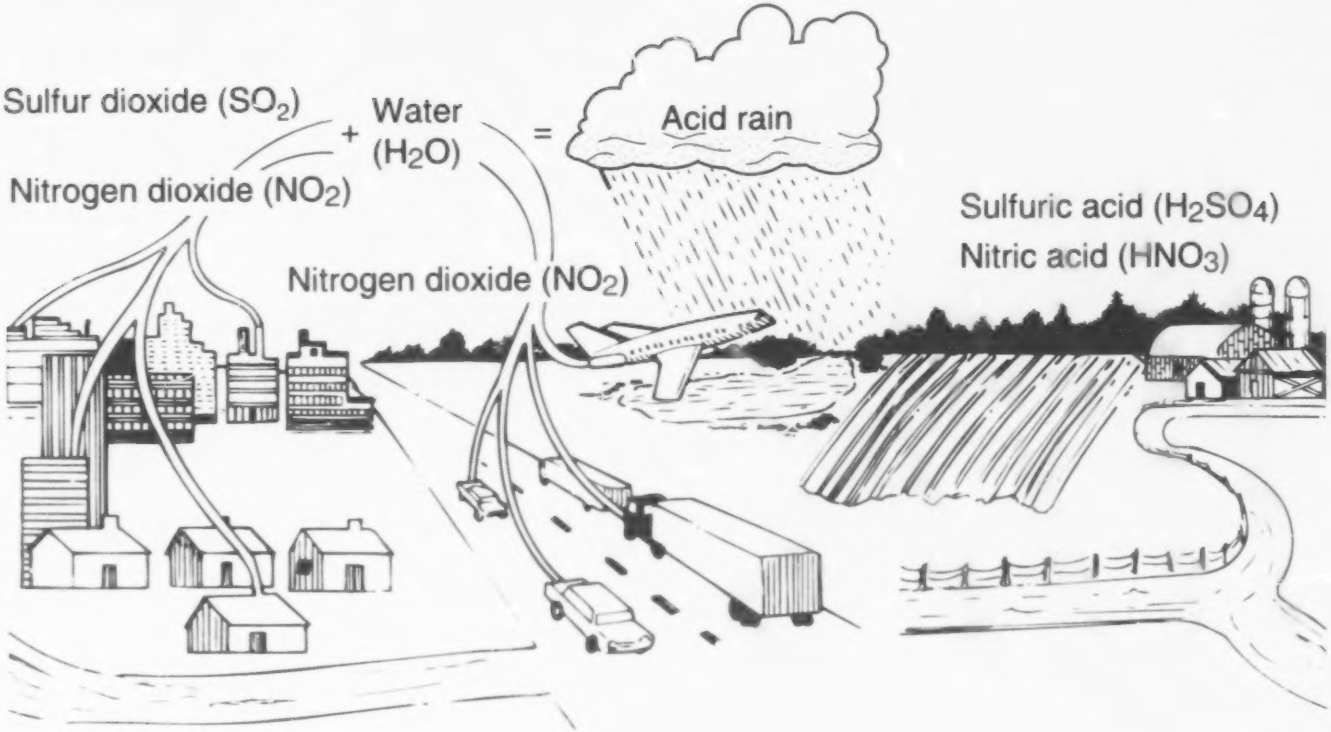
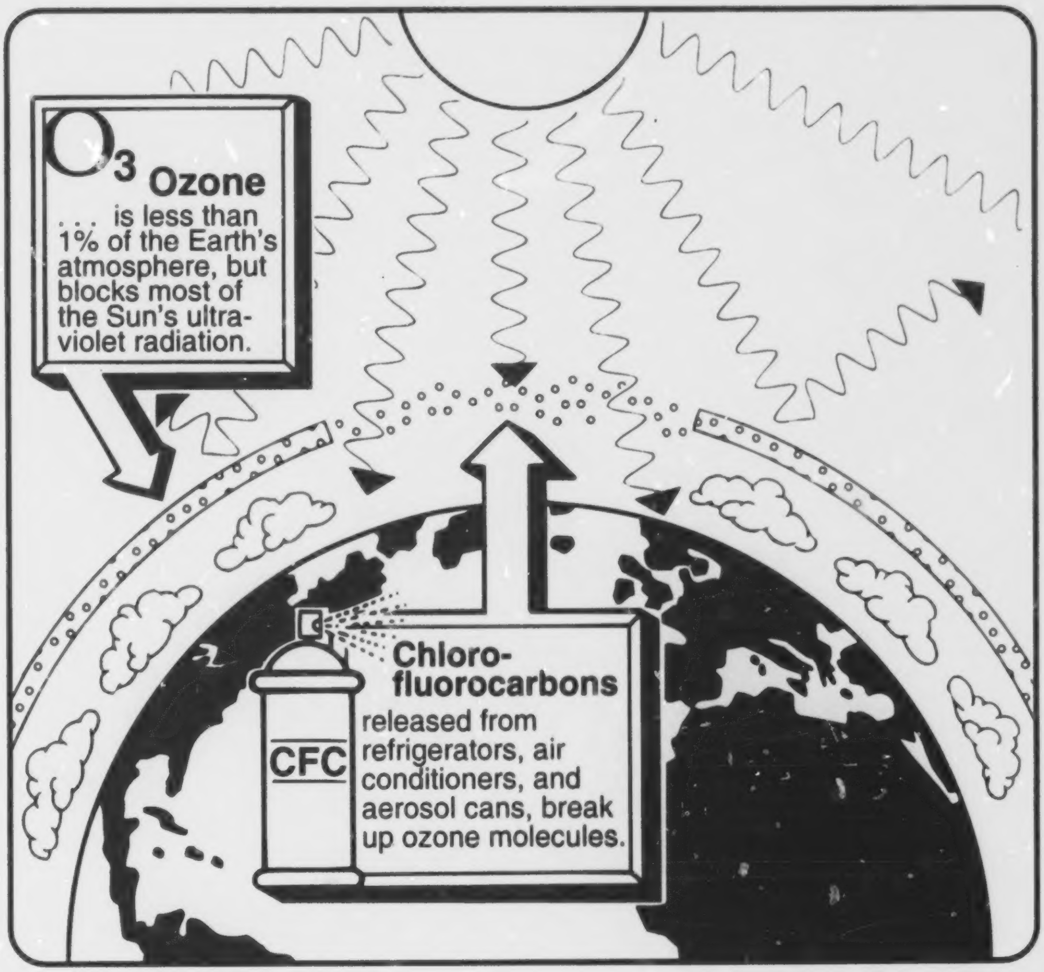
Acid Rain


Sulfur dioxide (SO_2)
Nitrogen dioxide (NO_2)
+
Water
(H_2O)
=
Acid rain
Nitrogen dioxide (NO_2)
Sulfuric acid (H_2SO_4)
Nitric acid (HNO_3)

Ozone Shield



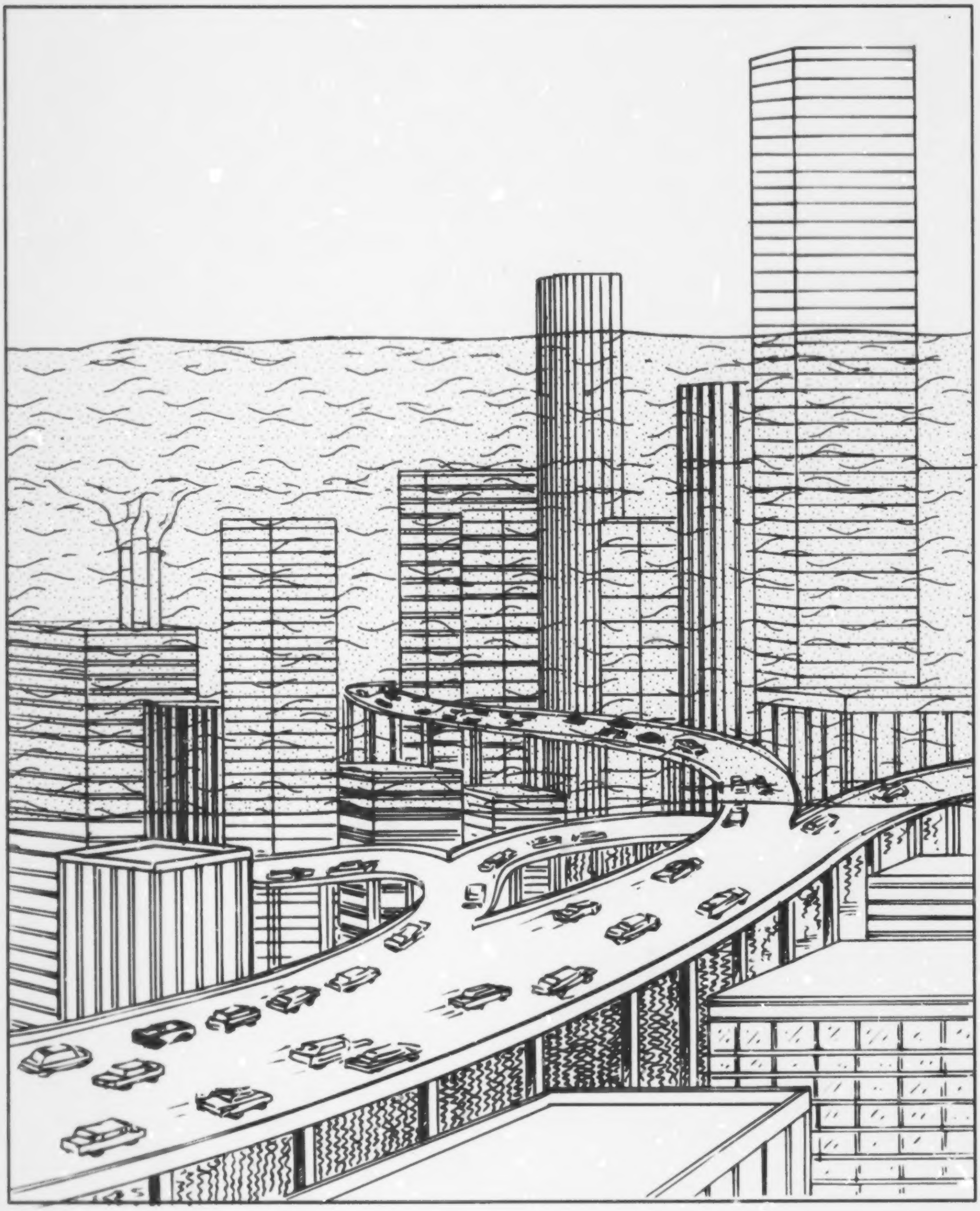
O_3 **Ozone**

. . . is less than 1% of the Earth's atmosphere, but blocks most of the Sun's ultraviolet radiation.

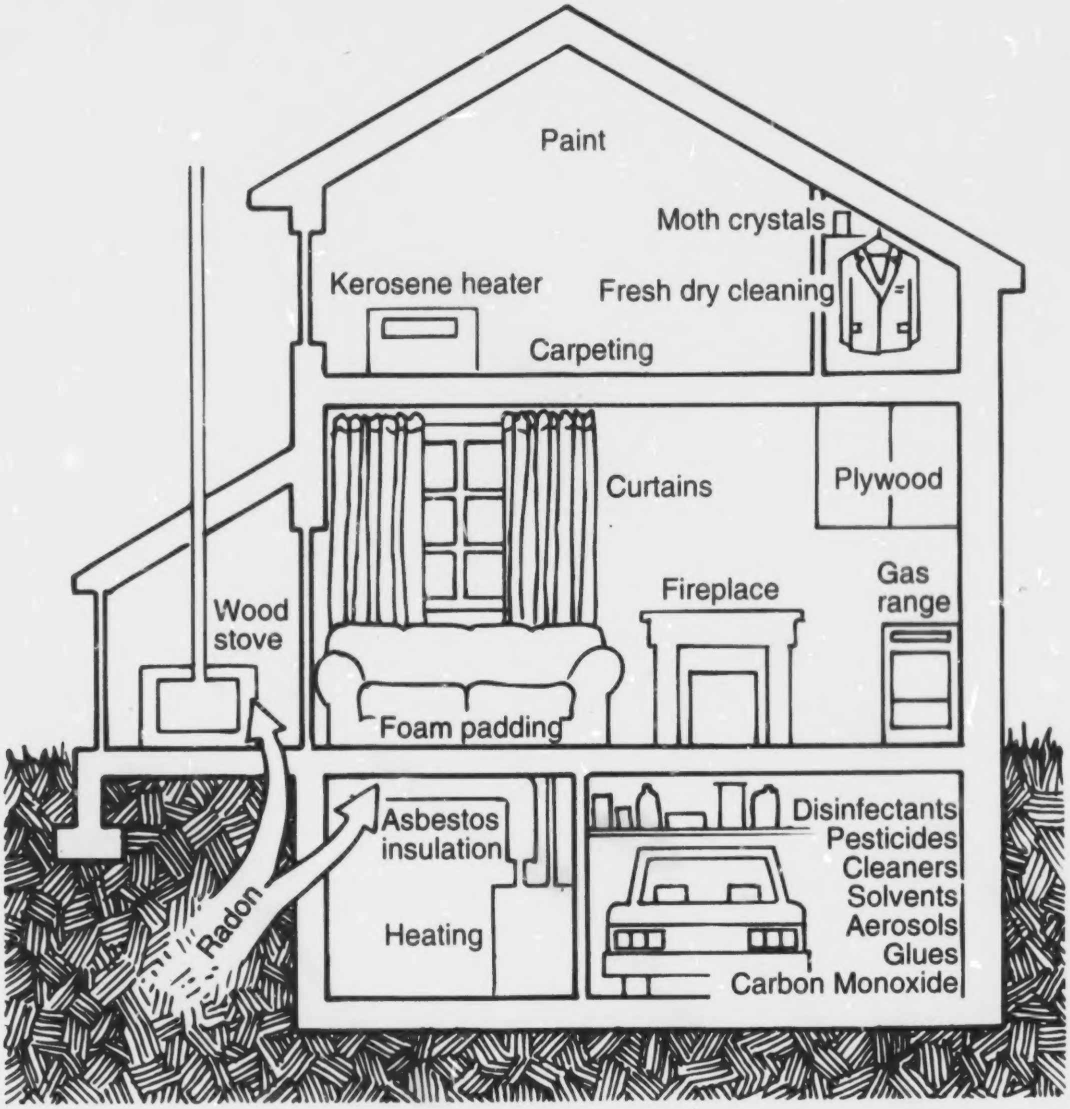
Chlorofluorocarbons

released from refrigerators, air conditioners, and aerosol cans, break up ozone molecules.

Smog



Indoor Air Pollution



Courtesy of U.S. Environmental Protection Agency

Energy Resources
Unit 6

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Nonrenewable Energy Resources (Objective 2)
  TM 2—Renewable Energy Resources (Objective 2)
  TM 3—Oil and Gas Production (Objectives 3 and 4)
  TM 4—Nuclear Energy Production (Objective 6)
  TM 5—Hydropower Production (Objective 7)
  TM 6—Biomass Conversion (Objective 8)
  TM 7—Solar Collector Panel (Objective 9)
  TM 8—Geothermal Reservoir (Objective 11)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignments, and plan presentation.

  Advanced Student Supplements

  1A—Anaerobic Decay and Methane Production
  2A—Ideas for a Simple Solar Collector

Suggested Activities

Advanced Assignment Sheet

1A—Analyze Current Reports Concerning Energy Resources

Advanced Job Sheets

1A—Build and Test a Solar Collector
2A—Build and Operate a Methane Generator

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets and job sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Arrange for representatives of the power generation industry—preferably those representing firms using several types of fuel to explain the process for making electricity. Also, you may wish to have representatives of the oil and natural gas industries visit with the class to explain how these products are extracted, refined, and transported to end users. **(Listening; acquiring scientific information)**
- Plan a field trip to an electrical generation plant. Have students prepare questions to ask about how electricity is generated and distributed to the customers. **(Listening; acquiring scientific information)**
- Following the completion of Assignment Sheet 2, organize a class debate on generation of electricity from coal vs. nuclear power. **(Comprehending written information and analyzing and applying what has been read to a specific task; speaking, critical thinking)**

Suggested Activities

- Invite a local utility representative to discuss energy audits his or her firm conducts, then have class members complete energy audits at home using Assignment Sheet 4 in this unit. **(Listening; critical thinking; comprehending written information and analyzing data)**
- Organize the class into teams to build a methane generator or a simple solar collector. (Optional job sheets in advanced applications supplement)

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.
- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.
- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet.
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate written test.
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Suggested Activities

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Suggested Resources

Resources Used in Developing This Unit

- Moran, Joseph M. et. al. *Introduction to Environmental Science*. New York: W. H. Freeman and Co.
- *Nuclear Electricity and Energy Independence*. U.S. Council for Energy Awareness, 1777 I Street, N.W. Washington, D.C. 20006.
- *Producing Your Own Power*. Emmaus, PA: Rodale Press, Inc., Book Division.

Supplemental Resources

Non-print Media

- *Green Energy*. 26 min. film. Examines renewable alternatives to petroleum products such as wood, corn, and garbage. Available from:

Films for the Humanities and Sciences
P.O. Box 2053
Princeton, NJ 08543
(800) 257-5126

Suggested Activities

- *Power Struggle* (2 parts). 58 min., 1986, video only. Produced by Public Policy Productions for WNET (PBS). Narrated by Meryl Streep. Discusses energy supplies and energy efficiency.

  Kilowatts from Cowpies: The Methane Option. 25 min., 1982, 16mm film or video. Produced by Henry Mayer, M.D. Overview of methane (biogas) as an energy resource.

  These are available from:

  Bull Frog Films, Inc.
  Oley, PA 19547
  (800) 543-FROG

- *Energy—The American Experience* (Revised). 29 min., 16mm film or video. Produced by Office of Public Affairs, Department of Energy. With the perspective of over 200 years of history, this program shows the development of different forms of energy and the changing cycle of energy sources from wood to coal to oil and gas to electrical energy. Available from:

  National Archives and Records Administration
  National Audiovisual Center
  Customer Services Section PY
  8700 Edgeworth Drive
  Capitol Heights, MD 20743-3701
  (800) 788-6282

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Energy Resources
Unit 6

Answers to Written Test

1. a. 13
   b. 4
   c. 10
   d. 5
   e. 11
   f. 9
   g. 2
   h. 12

2. a. R
   b. R
   c. N
   d. R
   e. N
   f. N
   g. R
   h. N
   i. R

3. a. Solid
   b. Nuclear
   c. Air pollution

4. a, b, e

5. b, c

6. a. Naturally-occurring
   b. Colorado
   c. Mined like coal
   d. Radioactive waste

7. b, d

8. a. Waste
   b. Pollution

9. a, d

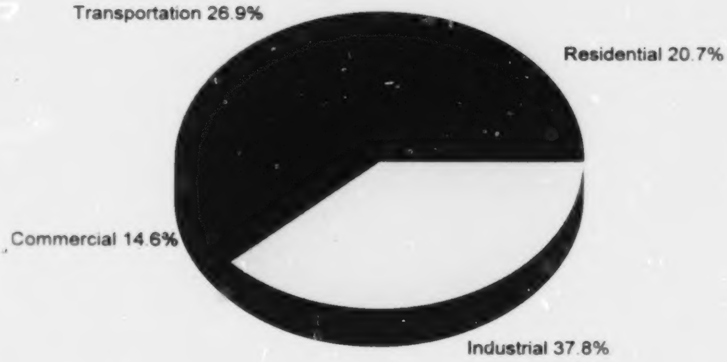
10. a. Wind machines
    b. Is not
    c. 10

11. a

12. a. 4
    b. 5 or 1
    c. 3
    d. 1 or 5

Answers to Written Test

13.



14. a, d, e

15. Any two of the following for each:

a. Residential

1) Build energy-efficient homes.
2) Insulate and weather strip existing homes.
3) Turn off lights when not needed.
4) Reduce thermostat settings in winter.
5) Purchase energy-efficient appliances.
6) Conserve hot water use.
7) Recycle household products and compost yard waste.

b. Transportation

1) Increase vehicle fuel economy by reducing weight.
2) Reduce speed.
3) Use car pools.
4) Increase fuel-efficiency of engines.
5) Improve aerodynamics of vehicle design.

c. Commercial/businesses

1) Similar to residential conservation efforts—Students may list several.
2) Install alternate energy devices such as solar.

Answers to Written Test

d. Industrial

  1) Turn off equipment when not in use.
  2) Improve equipment efficiency.
  3) Improve manufacturing processes.
  4) Reuse heat generated.
  5) Recycle raw materials.

e. Electricity generation

  1) Conserve energy resources which are in short supply in the U.S.
  2) Generate electricity by converting to U.S. energy resources which are renewable or that will last several hundred years.

16. Any three of the following:

  a. Engineer—Petroleum, mining, nuclear
  b. Geologist
  c. Chemist
  d. Physicist—Nuclear, geologic
  e. Mineralogist

Energy Resources
Unit 6

Written Test

Name ______________________________ Date ________________ Score ____________

1. Match terms related to energy resources with their definitions. Write the corresponding numbers on the blanks provided.

______a. A radioactive element which gives off energy when its atom is split

______b. Planned management of energy resources which conserves, protects, and prevents waste

______c. To reuse or process waste for beneficial purposes

______d. Energy resources which have not been used

______e. Energy resources that can be replaced after use

______f. An order by a government to prohibit oil shipments

______g. The chemical process of burning which releases heat, light, and chemical by-products

______h. Rotating device driven by wind or water that is used to provide power

1. Barrel
2. Combustion
3. Energy
4. Energy conservation
5. Energy reserves
6. Energy resources
7. Fossil fuels
8. Nonrenewable energy
9. Oil embargo
10. Recycle
11. Renewable energy
12. Turbine
13. Uranium

2. Classify the following energy resources as renewable (R) or nonrenewable (N) by placing the designated letters on the blanks provided.

______a. Wind

______b. Biomass

______c. Oil

______d. Solar

______e. Coal

______f. Uranium

______g. Hydropower

______h. Natural gas

______i. Geothermal

Written Test

3. Complete the following statements concerning coal energy resources. Circle or underline the correct words.

   a. Coal is a dark brown to black, flammable, (liquid) (solid) fossil fuel.

   b. The cost of producing electricity from coal is 10% higher than electricity produced in (nuclear) (biomass) power plants.

   c. A major environmental concern of coal use is (air pollution) (water pollution).

4. Select true statements concerning oil energy resources. Place an "X" in the blanks next to the true statements.

   ______a. Oil can be refined into many products.

   ______b. Oil is produced by drilling a well to the resource formation.

   ______c. Oil is much more expensive to use than coal.

   ______d. Oil wells are known to pollute ground water.

   ______e. Using oil poses no threat to the environment.

5. Select true statements concerning natural gas energy resources. Place an "X" in the blank(s) next to the true statement(s).

   ______a. Natural gas is principally composed of ethane.

   ______b. Natural gas is generally found in the presence of oil in subsurface formations.

   ______c. Environmental problems associated with natural gas are minimal as compared with coal, oil, and nuclear fuels.

6. Complete the following statements concerning nuclear energy resources. Circle or underline the correct words.

   a. Uranium is a (man-made) (naturally-occurring) element.

   b. Commercial quantities of uranium are found in (Oklahoma) (Colorado).

   c. Uranium is (mined like coal) (drilled like oil).

   d. An environmental problem associated with nuclear energy is (air pollution) (radioactive waste).

Written Test

7. Select true statements concerning hydropower energy resources. Place an "X" in the blanks next to the true statements.

______a. Hydropower is the process of wind turning turbines which turn alternators which generate electricity.

______b. Dams are used to harness hydropower.

______c. The U.S. is currently using only 2% of its hydropower resources.

______d. Hydropower is the most economical source of electricity.

______e. The most serious environmental concern about hydropower is air pollution.

8. Complete statements concerning biomass energy resources. Circle or underline the correct words.

a. Plant materials and animal (parts) (waste) are used as sources of fuel in biomass conversion.

b. Using biomass as a direct heat source can result in serious (disease) (pollution) problems.

9. Select true statements concerning solar energy resources. Place an "X" in the blanks next to the true statements.

______a. Solar collectors are used to store and transmit heat.

______b. Solar systems are very economical for cooling homes and businesses.

______c. Installation of solar systems is very inexpensive, only around $500 today.

______d. Solar energy is a clean source of energy.

______e. Low temperature solar systems can be used to produce electricity.

______f. The materials for photovoltaic devices are in limited supply.

______g. The cost of the raw materials for photovoltaic cells is the reason that photovoltaic systems are expensive.

10. Complete statements concerning wind energy resources. Circle or underline the correct words.

a. Wind energy is usually harnessed by (wind machines) (air turbines).

b. Wind energy (is) (is not) very damaging to the environment.

c. Wind speeds of (10) (40) mph are necessary for wind energy.

Written Test

11. Select true statements concerning geothermal energy resources. Place an "X" in the blanks next to the true statements.

_____a. Geothermal energy is produced by drilling wells to underground steam formations.

_____b. Electricity produced from geothermal sources is very expensive compared to other energy sources.

_____c. Geothermal energy is very clean and creates no pollution problems.

_____d. Most geothermal resources are located in the South.

12. Match U.S. energy resources with their correct reserve supplies. Write the corresponding numbers on the blanks provided.

_____a. U.S. has 4% of the world's supply

_____b. U.S. has 25% of the world's supply

_____c. U.S. has enough for 54 years

_____d. U.S. has enough for 300 years

1. Coal
2. Hydropower
3. Natural gas
4. Oil
5. Uranium

13. Draw a pie chart showing the use of oil resources in the United States.

Written Test

14. Select from the following list the goals of energy conservation by placing an "X" next to the appropriate goals.

______a. To save money

______b. To produce more energy sources

______c. To use more energy

______d. To improve the environment by reducing harmful emissions

______e. To reduce our reliance on foreign energy for political and economic reasons

15. List two ways to conserve energy for each of the following energy uses.

a. Residential

1) ______________________________

2) ______________________________

b. Transportation

1) ______________________________

2) ______________________________

c. Commercial/businesses

1) ______________________________

2) ______________________________

d. Industrial

1) ______________________________

2) ______________________________

e. Electricity generation

1) ______________________________

2) ______________________________

Written Test

16. List three careers in energy resources.

a. ______________________________

b. ______________________________

c. ______________________________

*Permission to duplicate this test is granted.

Energy Resources
Unit 6

Unit Evaluation Form

Student Name ______________________________ Unit Rating ____________

Assignment Sheet Ratings

Assignment Sheet 1—Discuss the Effects of a Middle East Oil Embargo Rating ______

Comments: ____

____

Assignment Sheet 2—Compare Electricity Production from Coal and Nuclear Fuels Rating ______

Comments: ____

____

Assignment Sheet 3—Research and Report on Using Agricultural Products as Alternative Energy Resources Rating ______

Comments: ____

____

Assignment Sheet 4—Perform an Energy Audit of Your Home Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Analyze Reports Concerning Energy Resources Rating ______

Comments: ____

____

Unit Evaluation Form

Job Sheet Ratings

Job Sheet 1A—Build and Test a Solar Collector Rating ______

Comments: ____

____

Job Sheet 2A—Build and Operate a Methane Generator Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

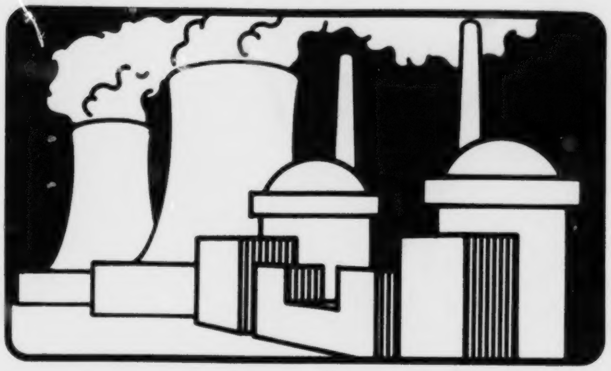
____

Teacher Signature ______________________ Date ______________

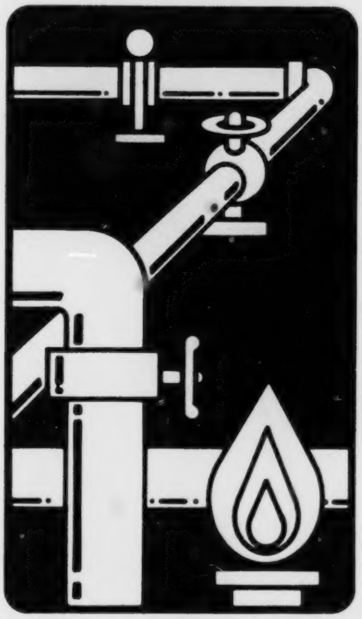
Student Signature ______________________ Date ______________

*Permission to duplicate this form is granted.

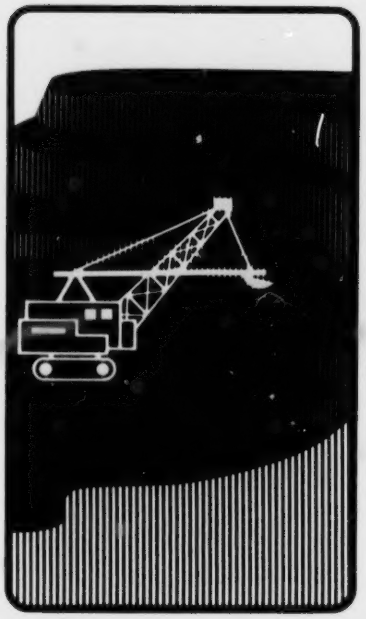
Nonrenewable Energy Resources



Uranium (Nuclear)



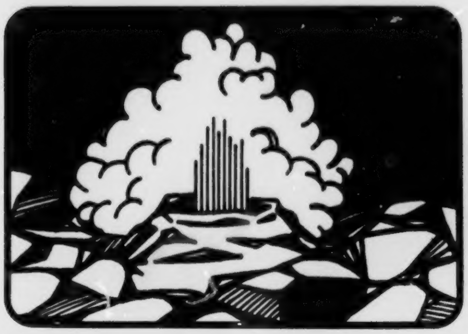
Natural Gas



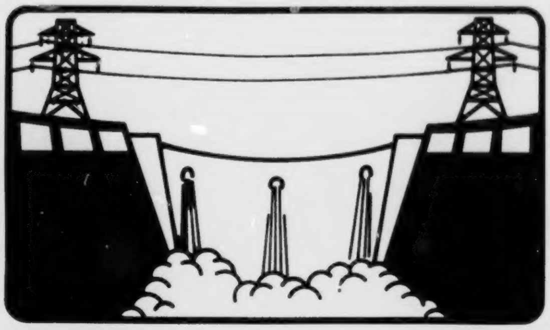
Coal

Oil

Renewable Energy Resources

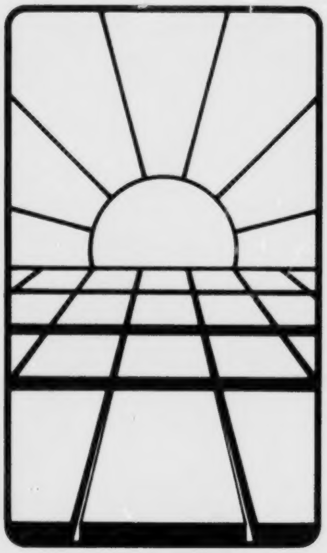


Geothermal

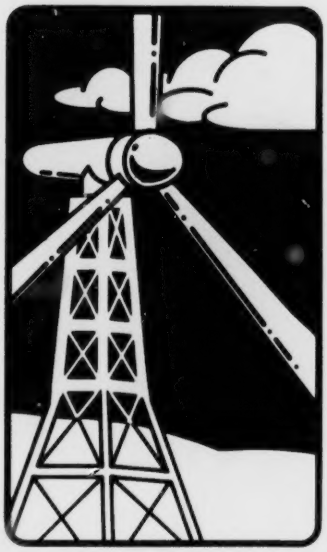


Hydropower (Water)

Biomass



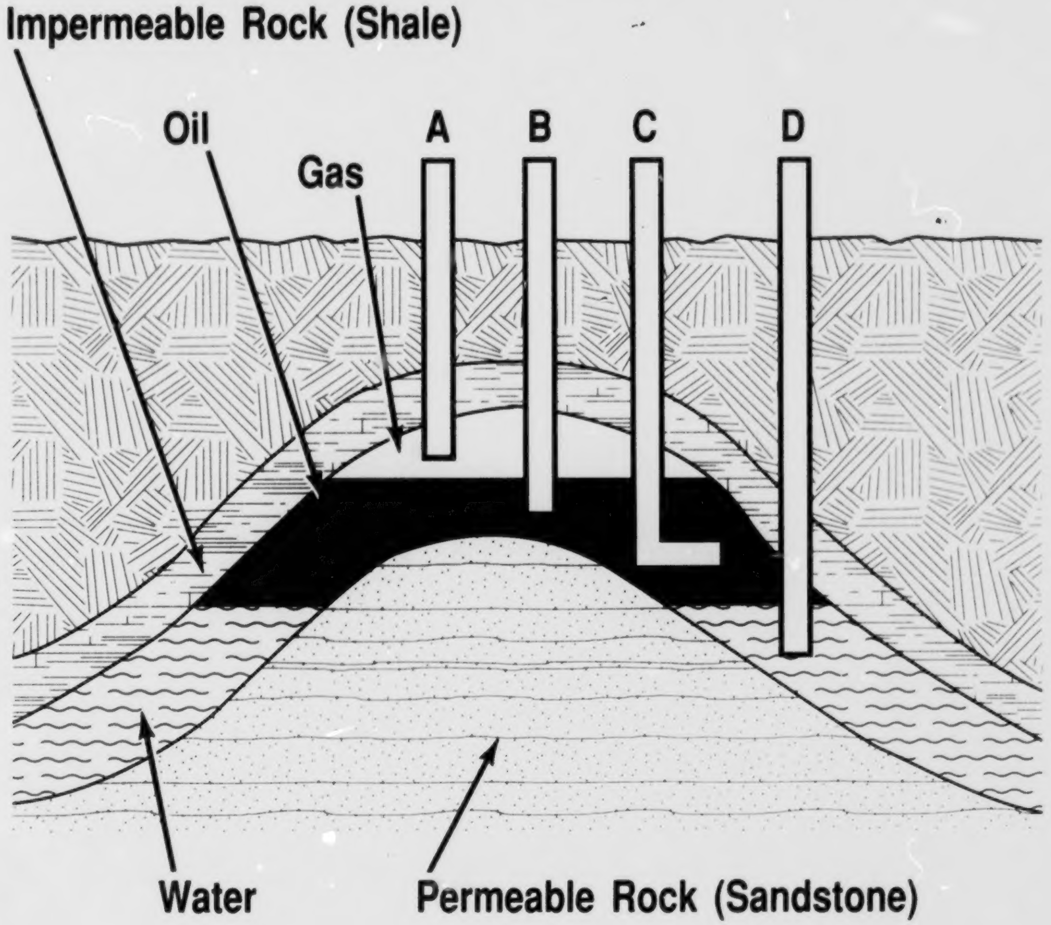
Solar



Wind

TM 2

Oil and Gas Production



Well A — Gas Well

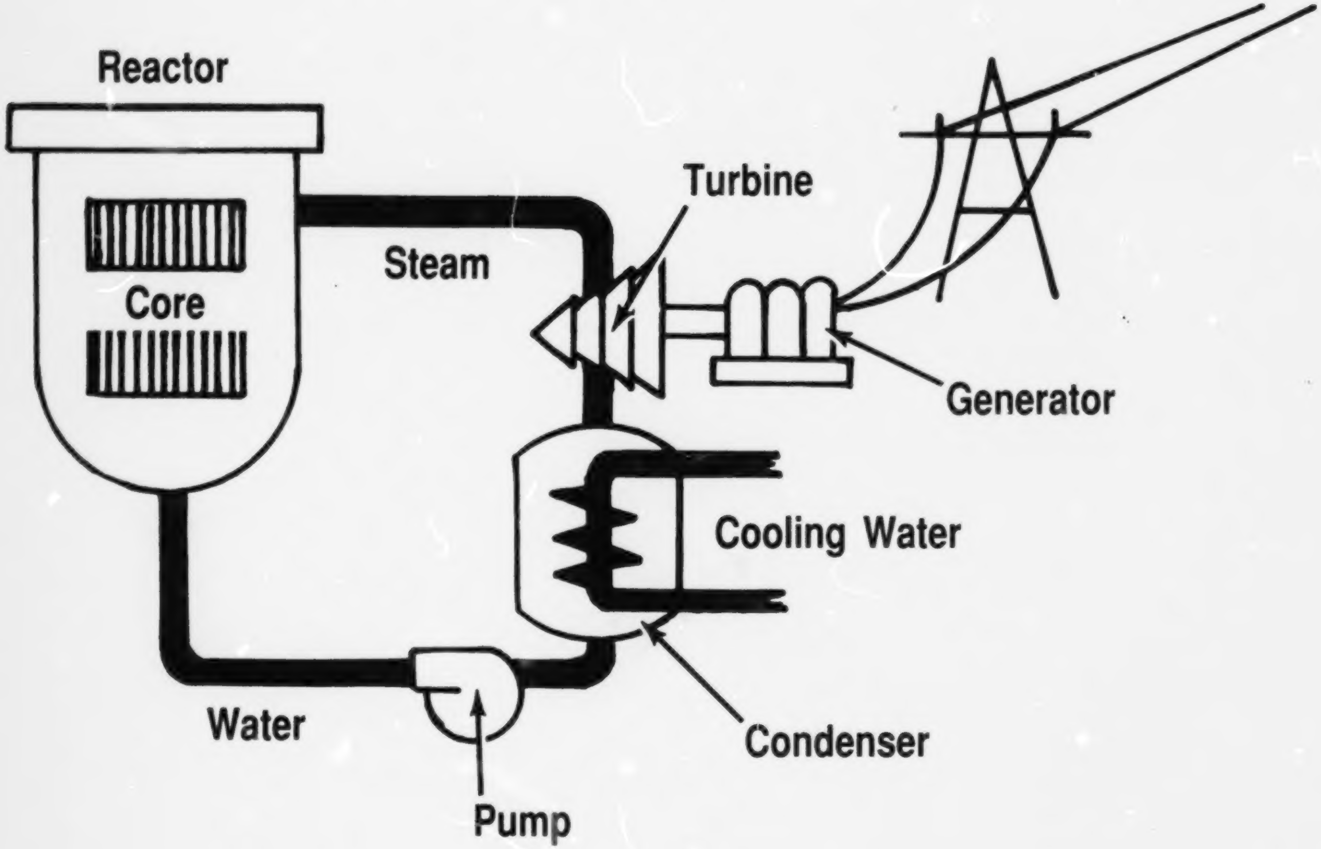
Well B — Conventional Oil Well

Well C — Horizontally Drilled Oil Well (increases production)

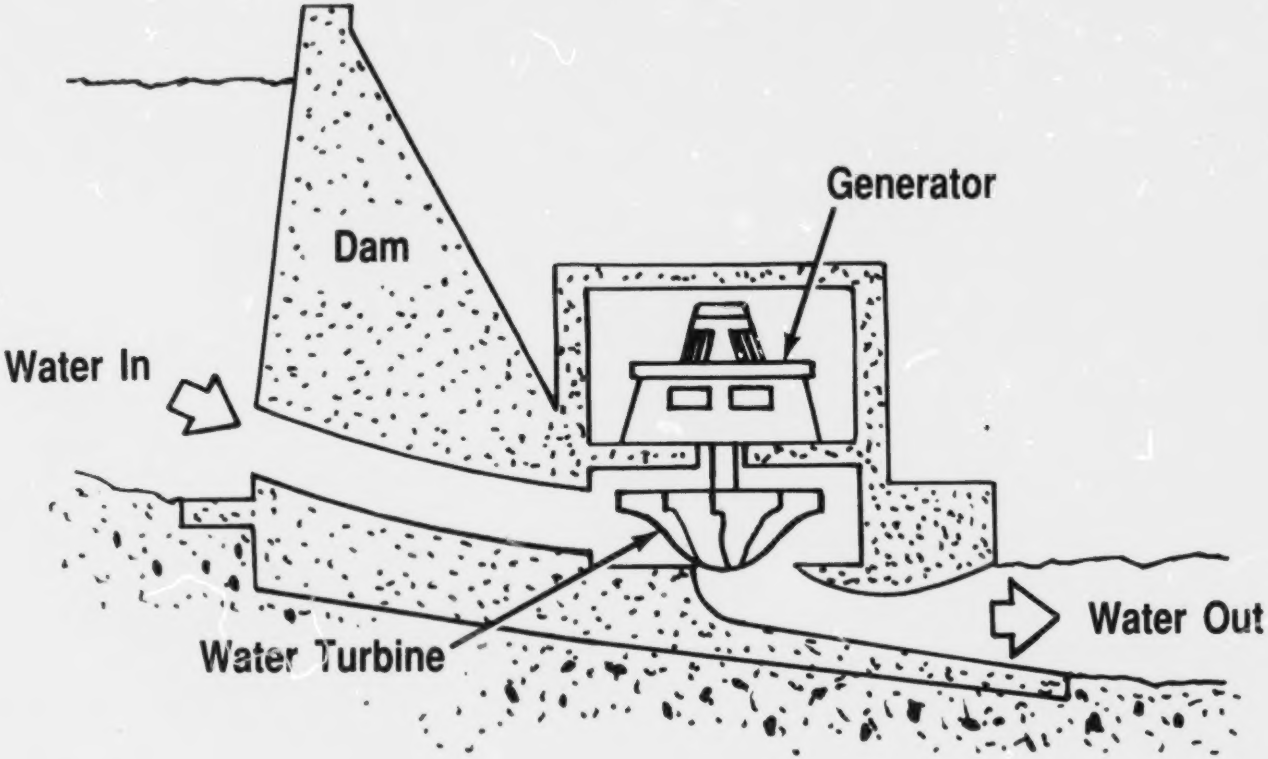
Well D — Water Well

NOTE: Layers of rock trap oil and natural gas.

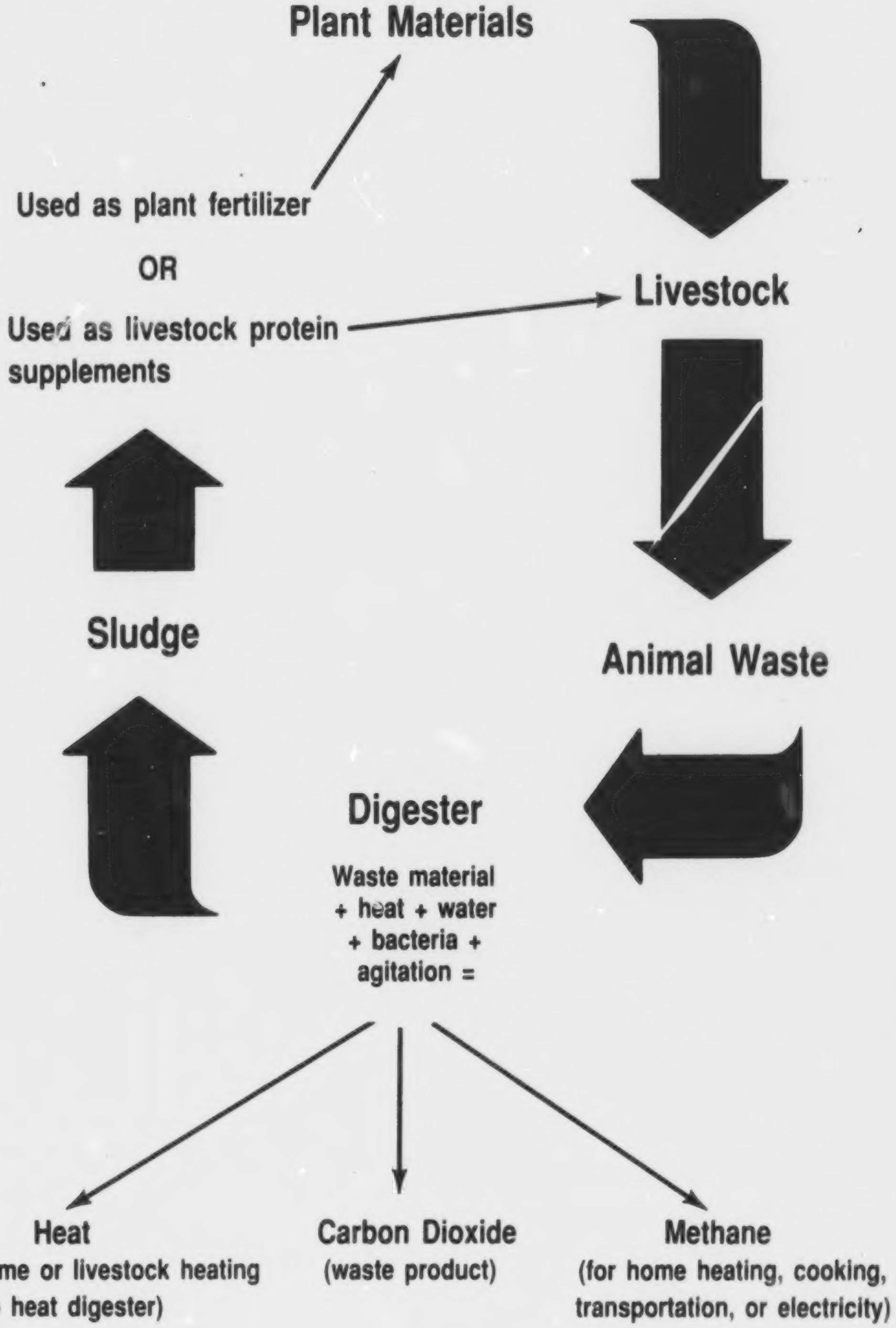
Nuclear Energy Production



Hydropower Production



Biomass Conversion



Plant Materials

Livestock

Animal Waste

Digester

Waste material
+ heat + water
+ bacteria +
agitation =

Heat
(for home or livestock heating
and to heat digester)

Carbon Dioxide
(waste product)

Methane
(for home heating, cooking,
transportation, or electricity)

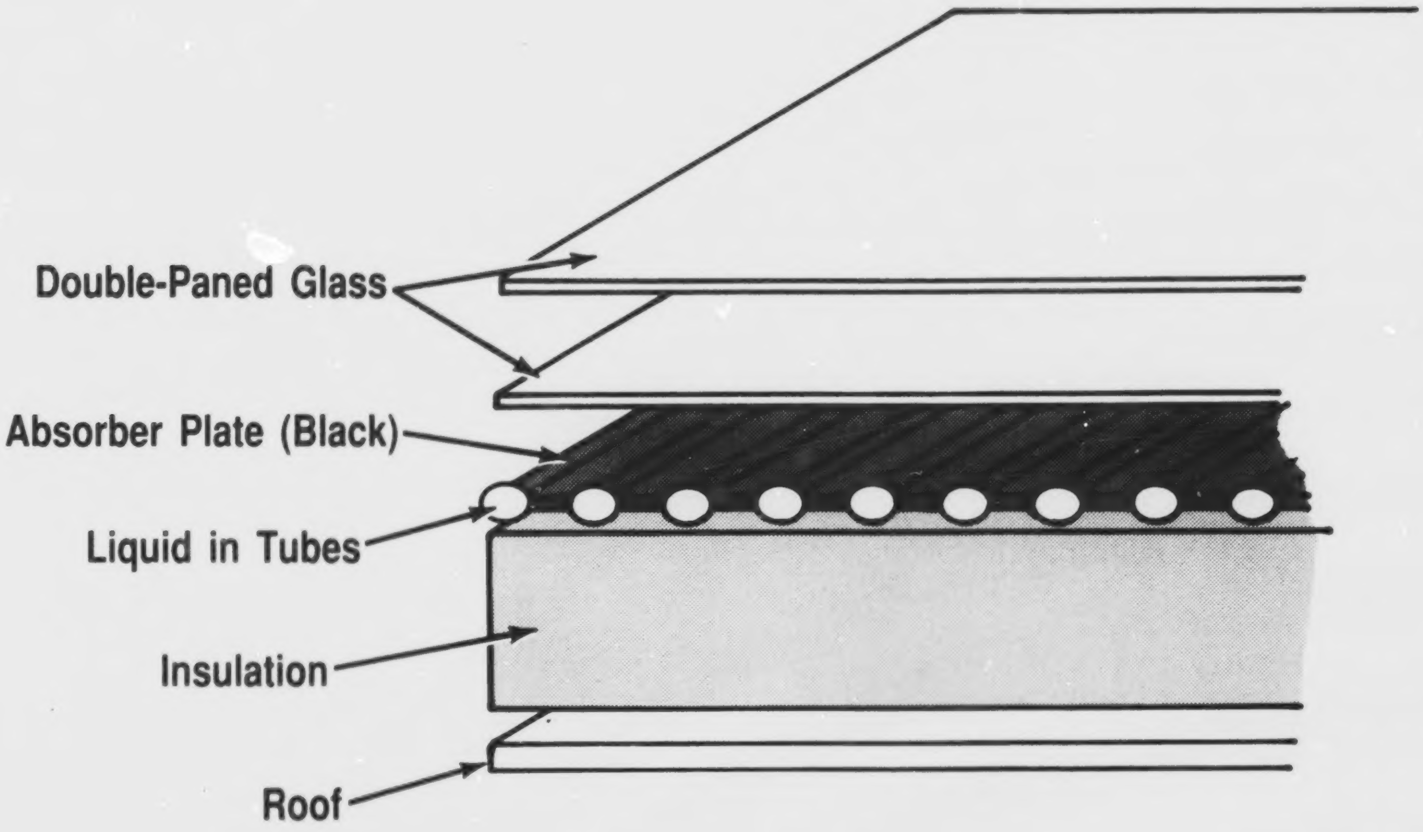
Sludge

Used as plant fertilizer

OR

Used as livestock protein
supplements

Solar Collector Panel

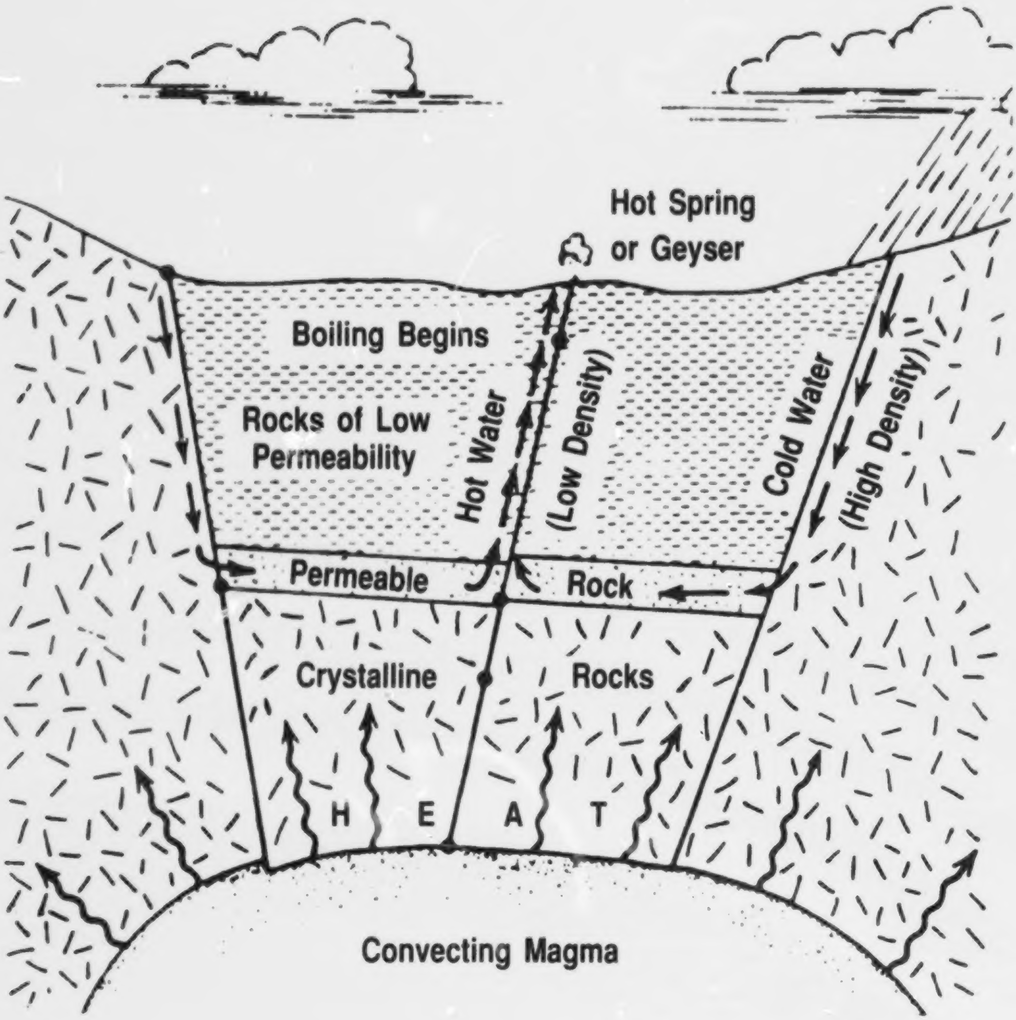


NOTE: Heat from sun is absorbed by liquid in absorber plate. Heat is transported through building.

Introduction to Natural Resources, Unit 6
Teacher Page 31

TM 7

Geothermal Reservoir



Forestry
Unit 7

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain various resources such as films, videotapes, and other materials to supplement instruction of this unit.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Main Parts of a Tree (Objective 2)
  TM 2—Classifications of Trees (Objective 9)
  TM 3—Forest Regions of the United States (Objective 13)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignments, and plan presentation.

  Advanced Assignment Sheets

  1A—Project Economic Returns From a Forestry Plot
  2A—Analyze Areas of Conflict in Maintaining Forests and Urban Trees
  3A—Analyze Current Reports Concerning Areas of Conflict in Forestry

Suggested Activities

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets and job sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Arrange for representatives of your state's forestry department or foresters from your state's land-grant university's Cooperative Extension Service to visit the class to discuss the suitability of certain trees in various settings; careers in forestry; forest management and public policy; and economic potential of home or farm forestry projects. **(Listening; acquiring scientific information; career awareness; reasoning)**
- Meet with and enlist local land and property owners who would allow class members to use their property to survey timber stands, forestry practices, etc.
- Have students collect and exhibit common tree leaves from your local area, identifying and classifying the trees according to their genus, species, etc. **(Comprehending written information and analyzing it; applying what has been read to a specific task; writing, critical thinking)**
- Involve the class members with a science or biology class in a tree planting project. **(Organizational effectiveness; teamwork; leadership)**
- Supply students with several cross-section cuts of tree trunks to allow them to count annular rings in aging the tree (Assignment Sheet 2). Use the opportunity to discuss what the size of the rings may tell about the growing season of the particular tree in question.
- Visit a saw mill, paper mill, or logging site. Encourage students to ask questions during the visit and assign them a report detailing what they learned on the outing. **(Listening; writing; critical thinking)**

Suggested Activities

- Discuss wood measurements, detailing the standard cord measurement vs. a "rick" or a "face cord," so often used in firewood measure. Assign the students math problems dealing with cord measures. **(Solving mathematical problems; listening)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.
- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.
- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate written test.
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

  Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

  Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Suggested Activities

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Suggested Resources

Resources Used in Developing This Unit

- Anderson, David A. *Forests and Forestry*, 3rd ed. Danville, IL: The Interstate Printers & Publishers, Inc.
- Burns, Russell. *The Scientific Basis for Silviculture and Management Decisions in the National Forest System*. USDA, U.S. Forest Service, Washington, D.C.: U.S. Government Printing Office, 1989.
- Camp, William G. and Thomas B. Daugherty. *Managing Our Natural Resources*. Albany, NY: Delmar Publishers Inc., 1988.
- Collins, B. McManus. *Elementary Forestry*. Reston, VA: Reston Publishing Co., Inc.
- Kircher, Harry B. *Our Natural Resources and Their Conservation*, 6th ed. Danville, IL: The Interstate Printers & Publishers, Inc., 1988.
- *Managing Forested Lands for Wildlife*. Developed in cooperation with USDA U.S. Forest Service, Rocky Mountain Region, Published by Colorado Division of Wildlife.
- McClay, David R. *Occupational Preparation in Natural Resources*. Washington, D.C.: U.S. Government Printing Office.
- National 4-H Council. 4-H Forestry Program. *Unit A—Trees*. Washington, D.C.: United States Department of Agriculture.

Suggested Activities

- *Plant a Tree for Your Special Occasion*, FS 363. USDA U.S. Forest Service.
- *Planting and Care of Farm Forests*, VAS 4024. Urbana, IL: University of Illinois.

Supplemental Resources

Print Media

- *Forestry Supplies Inc. Catalog* — Available from:

  Forestry Supplies, Inc.
  205 W. Rankin Street
  P.O. Box 8397
  Jackson, MS 39204

- *Project Learning Tree Activity Guide*. Developed by the American Forest Foundation and the Western Regional Environmental Education Council. To obtain this activity guide, you must attend a Project Learning Tree (PLT) workshop. Contact your state conservation, natural resource, or forestry department for more information on these workshops.

Non-print Media

- *Forestry and Related Review* — Software for Apply II+, IIe, IIc, and for IBM and compatibles. Covers forest management, wood uses, forestry math, planting trees, and other topics.

  Forest Harvesting Equipment — 35 color slide presentation with a 12 minute cassette tape and script included. Shows modern forestry equipment and procedures.

  Tree Growth and Identification, H-75477 — 20 min. ½" VHS. Discusses how trees grow and how to tell one from another.

  These are available from:

  Hobar Publications
  1234 Tiller Lane
  St. Paul, MN 55112
  (612) 633-3170

- *Forestry: An Overview* — 20 min., © 1987, ½" and ¾" video. Deals with controversy between clear cutting and selective cutting.

  Managing the Old Growth Forests — 20 min., © 1987, ½" and ¾" video. Covers old growth ecological systems and debate over cutting them.

Suggested Activities

These are available from:

Centre Productions, Inc.
Distributed by Barr Films
12801 Schabarun Avenue
P.O. Box 7878
Irwindale, CA 91706-7878
(818) 338-7878 or (800) 234-7879

- *Choices '85* — 29 min., © 1985, 16 mm or video. Produced by The Conservation Foundation. Discusses national forest planning and its relationship to the Forest and Rangeland Renewable and Resources Planning Act of 1975.

  Common Ground — 29 min., © 1985, 16 mm or video. Produced by The Conservation Foundation. Examines the complex forest policy issues.

  Replanting the Tree of Life — 20 min., © 1987, 16 mm or video. Produced by Asterisk Productions. Discusses the essential part that trees play in our lives and in the life of the planet.

These are available from:

Bull Frog Films, Inc.
Oley, PA 19547
(800) 543-FROG

- *Wildfire Strikes Home* (3 parts) — Part 1 is 14 min., Part 2 is 15 min., and Part 3 is 23 min. Shows firefighting, problems with interface areas and fires, and what can be done about fires. Produced by:

U.S. Forest Service
P.O. Box 96090
Washington, D.C. 20090-6090

Forestry
Unit 7

Answers to Assignment Sheets

Assignment Sheet 1—Identify Specific Trees

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 2—Determine the Age of a Tree

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 3—Classify Local Trees

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 4—Determine Uses of Wood and Wood By-products

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 5—Solve Cord Measurement Problems

1.	a.	48 cu. ft.	f.	192
	b.	64	g.	128
	c.	96	h.	320
	d.	64	i.	120
	e.	80	j.	640
2.	a.	37.5%	f.	150
	b.	50	g.	100
	c.	75	h.	250
	d.	50	i.	93.8
	e.	62.5	j.	500
3.	a.	$26.25	f.	$105.00
	b.	$35.00	g.	$70.00
	c.	$52.50	h.	$175.00
	d.	$35.00	i.	$65.55
	e.	$43.75	j.	$350.00

Forestry
Unit 7

Answers to Written Test

1.

a.	10	e.	12	i.	3	m.	9
b.	6	f.	15	j.	7	n.	1
c.	11	g.	13	k.	8	o.	16
d.	4	h.	17	l.	2	p.	14

2. a. T
   b. C
   c. R

3. a. Branch
   b. Twig
   c. Leaf
   d. Fruit
   e. Seed

4. a. Outer bark
   b. Phloem
   c. Cambium
   d. Xylem
   e. Heartwood

5. a. T
   b. L
   c. F

6. Any four of the following:

   a. Leaves
   b. Fruits
   c. Bark
   d. Buds
   e. Twigs
   f. Flowers
   g. Wood
   h. Growth habit
   i. Overall form

7. a, b, e

8. a. Spring
   b. Slower
   c. Branches
   d. Year
   e. Age

Answers to Written Test

9. b

10. Any three of the following:

    a. Shade
    b. Windbreaks
    c. Privacy and noise buffers
    d. Ornamental use
    e. Fruit and nut production
    f. Timber production

11. a, b, c, d, h

12. Any three of the following:

    a. U.S. Forest Service
    b. National Park Service
    c. Bureau of Land Management
    d. Bureau of Indian Affairs
    e. State forestry service
    f. City and county governments

13. a. Pacific Coast and Northwest
    b. Rocky Mountain (Western)
    c. Northern
    d. Central Hardwood
    e. Southern
    f. Tropical

14. a. 6
    b. 8
    c. 4
    d. 1
    e. 2
    f. 7

15. Any two of the following:

    a. Seeding (natural or direct)
    b. Stump sprouting
    c. Planting seedlings

16. a. 3
    b. 6
    c. 1
    d. 4
    e. 2

Answers to Written Test

17.
  a. Diameter tape
  b. Chain or tape
  c. Increment borer
  d. Tree scale (Biltmore) stick

18. Any three of the following:

  a. Insects
  b. Diseases
  c. Physical damage
  d. Fire

19. Any four of the following:

  a. Arson
  b. Debris burning
  c. Cigarettes, cigars, pipes
  d. Railroads
  e. Logging operations
  f. Lightning

20.
  a. 3
  b. 1
  c. 2

21. b

22. Any five of the following:

  a. Reduces the hazard of wildfire
  b. Readies the area for seeding and planting
  c. Stimulates sprouts and seedlings, thereby improving food sources for many wildlife
  d. Removes undesirable trees and brush
  e. Controls forest diseases
  f. Increases nutrient levels in forage
  g. Creates openings in dense forest stands which encourages natural regeneration of forest
  h. Makes access tot he forest easier

23. Any three of the following:

  a. Foresters
  b. Forestry technicians
  c. Loggers
  d. Log scalers
  e. Forestry researchers and industry representatives

Forestry
Unit 7

Written Test

Name ______________________ Date ____________ Score __________

1. Match terms related to forestry with their definitions. Write the corresponding numbers on the blanks provided. Definitions continue on next page.

_____ a. A complex community of associated trees, shrubs, other plants, and animals

_____ b. Loss of leaves, especially prematurely

_____ c. The art and science of managing forests so as to yield, on a continuous basis, a maximum in quality and quantity of forest lands to satisfy human needs

_____ d. Trees that bear seeds in cones and that have long, narrow (needlelike) leaves

_____ e. Mineral elements and compounds which a plant uses for tissue growth and maintenance

_____ f. The art of producing and caring for a forest

_____ g. The process of producing carbohydrates from water, carbon dioxide, chlorophyll, and light

_____ h. A single-stemmed woody plant usually over 20 feet high at maturity

_____ i. Green photosynthetic coloring matter in plants

_____ j. The study of trees

_____ k. Plants that retain their green foliage (leaves) throughout the year

_____ l. Trees that have wide, flat leaves

_____ m. All browse and non-woody food that is available to livestock or nongame animals

_____ n. The stem or trunk of a tree

1. Bole
2. Broadleaf
3. Chlorophyll
4. Conifer
5. Deciduous
6. Defoliation
7. Dendrology
8. Evergreen
9. Forage
10. Forest
11. Forestry
12. Nutrients
13. Photosynthesis
14. Sap
15. Silviculture
16. Transpiration
17. Tree

Written Test

_______ o. The release of water vapor by the leaves into the air

_______ p. The liquid that circulates through the tissue of woody plants

2. Distinguish among the main parts of a tree. Place the following letters next to their descriptions.

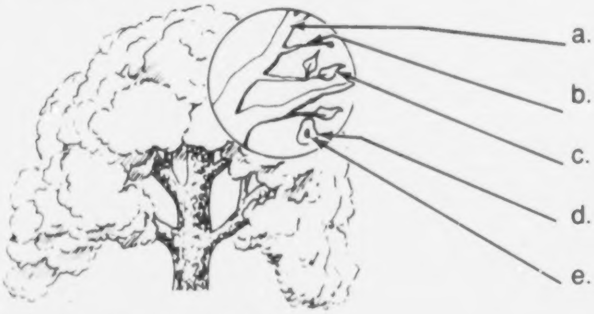
- C — Crown
- R — Roots
- T — Trunk

_______ a. The main stem of the tree that transports nutrients

_______ b. The foliage and flowering/fruiting part of the tree

_______ c. The underground part of the tree that extracts nutrients from the soil and atmosphere

3. Identify the following parts of the crown.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

4. Identify the following parts of the trunk.

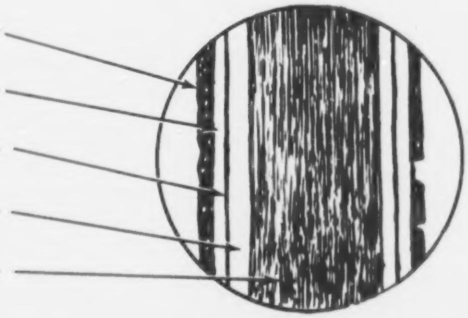
a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________



Written Test

5. Distinguish among the types of roots in a root system. Place the following letters next to their descriptions:

- F — Feeder roots and root hairs
- L — Lateral roots
- T — Tap roots

______ a. Grow vertically downward and anchor the tree

______ b. Grow horizontally and help keep the tree upright

______ c. Absorb water and minerals

6. List four ways that trees are identified.

a. ____

b. ____

c. ____

d. ____

7. Select true statements concerning the photosynthesis process. Place an "X" in the blanks next to the true statements.

______ a. Sugars and starches are carbohydrates.

______ b. Fats and proteins may be used for tree growth or respiration.

______ c. The by-product of photosynthesis is carbon monoxide.

______ d. Photosynthesis may occur in the dark.

______ e. Fats and proteins may be stored by the tree.

8. Complete the following statements concerning the growth of a tree by circling or underlining the correct words.

a. Trees begin growth in the (spring) (summer) when the temperature is warm enough.

b. Growth is (faster) (slower) in the summer because of the hot, dry weather.

c. Root tips, twigs, and (flowers) (branches) increase in length when cells become longer.

d. One annual ring is produced each (season) (year).

e. The (age) (type) of tree can be determined by counting the number of rings.

Written Test

9. Distinguish between the classifications of trees by placing an "X" next to the description of softwoods.

_____ a. Wood produced by deciduous (broadleaf) trees.

_____ b. Wood produced by conifers.

10. List three common uses of trees.

a. ____________________

b. ____________________

c. ____________________

11. Select from the following list the benefits of forests to the environment. Place an "X" in the blanks next to the correct benefits.

_____ a. Influence the climate

_____ b. Control water erosion

_____ c. Retain snowmelts

_____ d. Provide habitats for fish and wildlife

_____ e. Encourage floods

_____ f. Increase wind erosion

_____ g. Increase pollutants to the environment

_____ h. Provide oxygen to the atmosphere

12. List three government agencies involved in forestry.

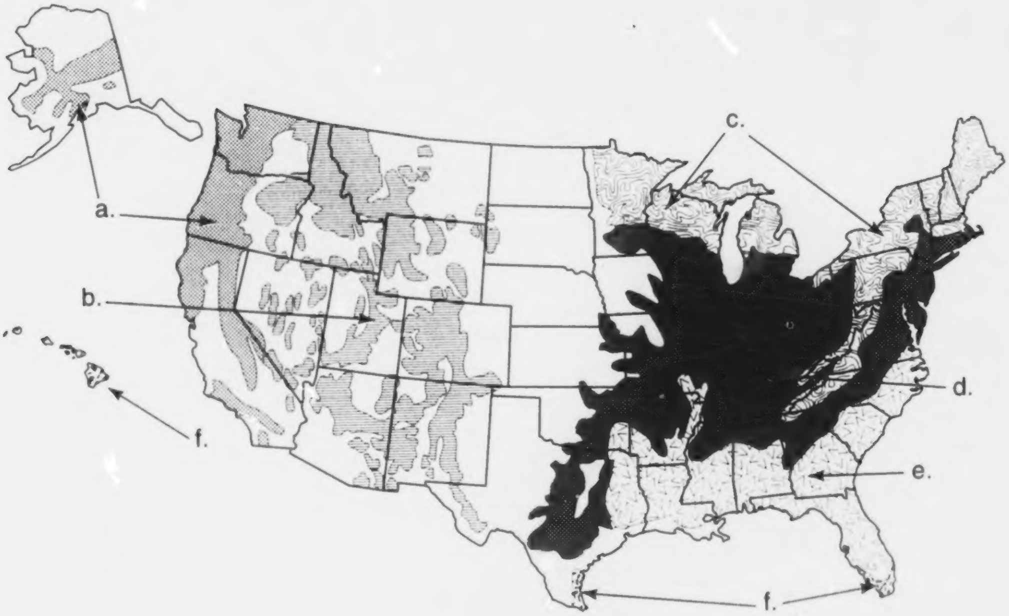
a. ____________________

b. ____________________

c. ____________________

Written Test

13. Identify the major forest regions of the United States.



a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

Written Test

14. Match the types of forest cuttings with their definitions. Write the corresponding numbers on the blanks provided.

______ a. Removing trees damaged by diseases or insects

______ b. Removing surplus trees

______ c. Used to regulate species composition or improve the growth and quality of a young stand up to sapling size

______ d. All the trees in a stand are harvested in a single operation

______ e. Removing financially or physically mature trees for timber

______ f. Individual marketable trees are selected and cut

1. Clear cutting
2. Harvest cutting
3. Improvement cutting
4. Release cutting
5. Salvage cutting
6. Sanitation cutting
7. Selective cutting
8. Thinning

15. List two ways that tree stands regenerate.

a. ______________________________

b. ______________________________

16. Match forest measurements with their descriptions. Write the corresponding numbers on the blanks provided.

______ a. Rough wood one foot on each side; contains 12 board feet

______ b. Used commonly in the pulp and paper industry

______ c. Rough wood one foot square and one inch thick

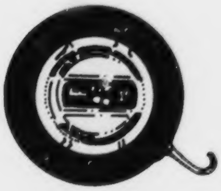
______ d. The distance across a tree at 4.5 feet above the ground

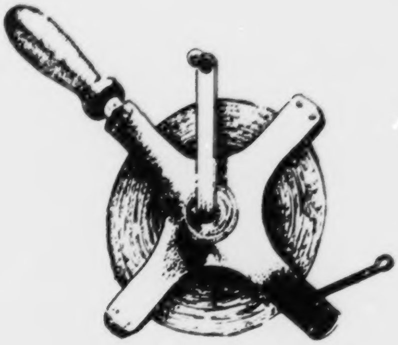
______ e. A stack of wood 4 ft. × 4 ft. × 8 ft. or 128 cu. ft.

1. Board ft.
2. Cord
3. Cubic ft.
4. Diameter
5. Piece
6. Weight

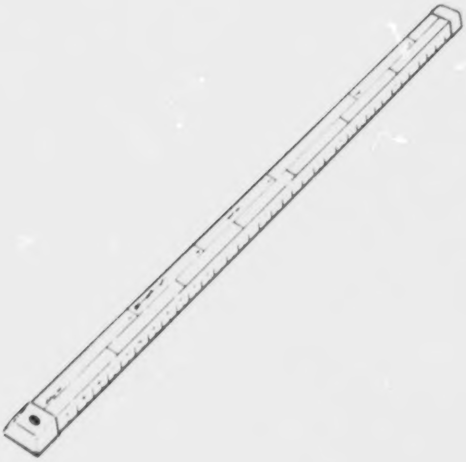
Written Test

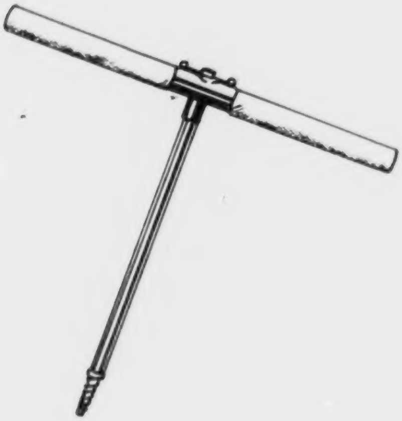
17. Identify the following measuring instruments used in forestry.





a. ______________________ b. ______________________





c. ______________________ d. ______________________

18. List three forest (tree) enemies.

a. ______________________

b. ______________________

c. ______________________

Written Test

19. List four causes of fire.

a. ______

b. ______

c. ______

d. ______

20. Match the types of forest fires with their descriptions. Write the corresponding numbers on the blanks provided.

______ a. Burn surface litter

______ b. Burn from top to top of trees or shrubs

______ c. Burn the organic matter beneath the surface litter

1. Crown fires
2. Ground fires
3. Surface fires
4. Wildfires

21. Distinguish between the categories of forest fires by placing an "X" next to the definition of controlled (prescribed) burn.

______ a. Fires burning out of control

______ b. Any burning that has been started intentionally as a forest management tool

22. List five benefits of controlled burns.

a. ______

b. ______

c. ______

d. ______

e. ______

23. List three career opportunities related to forestry.

a. ______

b. ______

c. ______

*Permission to duplicate this test is granted.

Forestry
Unit 7

Unit Evaluation Form

Student Name ______________________ Unit Rating __________

Assignment Sheet Ratings

Assignment Sheet 1—Identify Specific Trees Rating ______

Comments: ______________________

____

Assignment Sheet 2—Determine the Age of a Tree Rating ______

Comments: ______________________

____

Assignment Sheet 3—Classify Local Trees Rating ______

Comments: ______________________

____

Assignment Sheet 4—Determine Uses of Wood and Wood By-Products Rating ______

Comments: ______________________

____

Assignment Sheet 5—Solve Cord Measurement Problems Rating ______

Comments: ______________________

____

Job Sheet Ratings

Job Sheet 1—Plant a Bareroot Tree Rating ______

Comments: ______________________

____

Unit Evaluation Form

Job Sheet 2—Measure Diameter of a Tree Rating ______

Comments: ____________________

____

Job Sheet 3—Measure Merchantable Height of a Tree Rating ______

Comments: ____________________

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Project Economic Returns From a Forestry Plot Rating ______

Comments: ____________________

____

Assignment Sheet 2A—Analyze Areas of Conflict in Maintaining Forests and Urban Trees Rating ______

Comments: ____________________

____

Assignment Sheet 3A—Analyze Current Reports Concerning Areas of Conflict in Forestry Rating ______

Comments: ____________________

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Unit Evaluation Form

Other ____

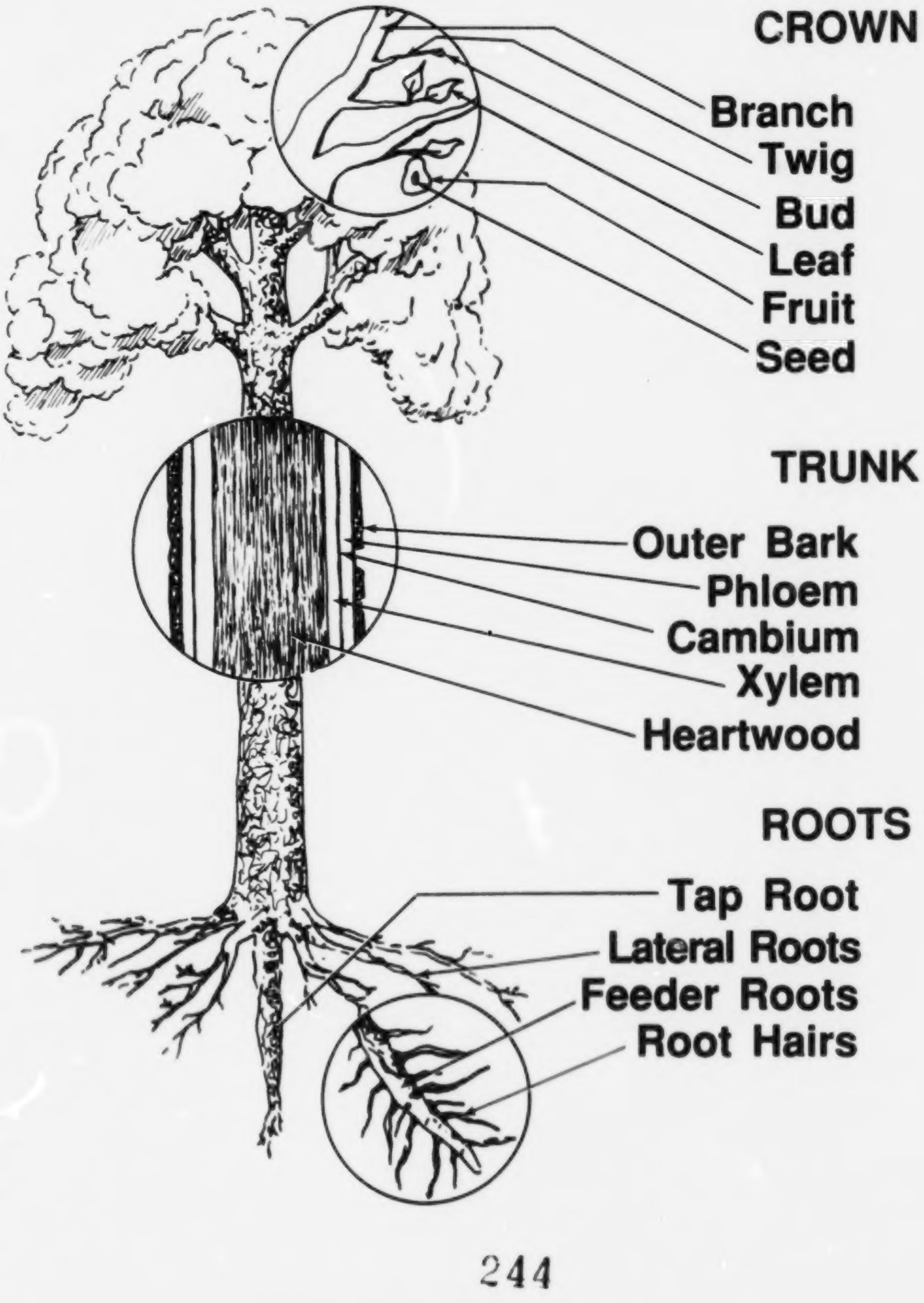
____

Teacher Signature ______________________ Date __________

Student Signature ______________________ Date __________

***Permission to duplicate this form is granted.**

Main Parts of a Tree

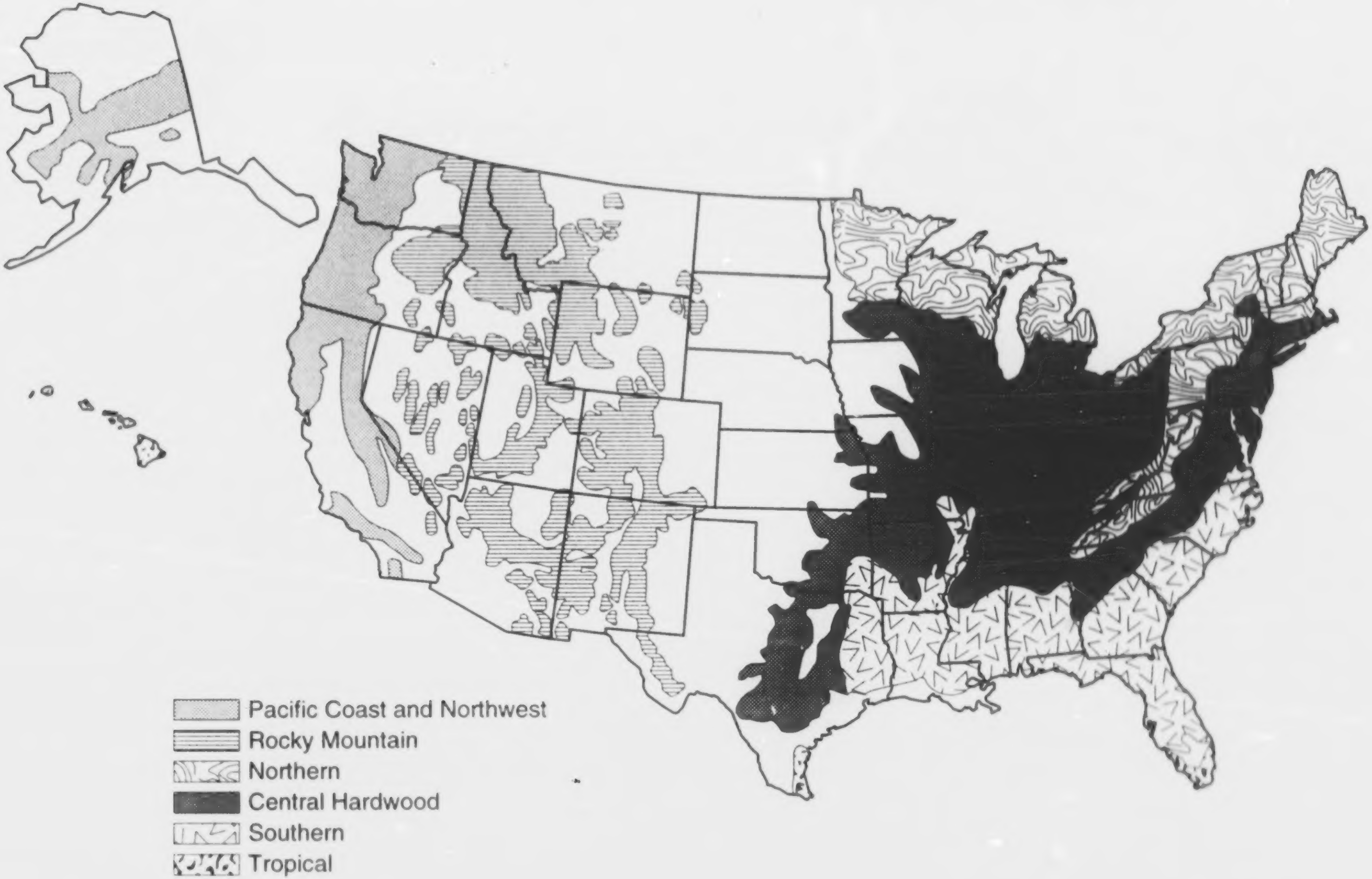


Classifications of Trees

Softwoods
From Coniferous Trees

Hardwoods
From Deciduous Trees

Forest Regions of the United States



Wildlife Management
Unit 8

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain various resources such as films, videotapes, and equipment, and other materials to supplement instruction of this unit.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Food Chains (Objective 2)
  TM 2—Biotic Pyramid (Objective 2)
  TM 3—Food Web (Objective 3)
  TM 4—Agricultural Practices That Support Wildlife (Objective 12)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignments, and plan presentation.

  Advanced Assignment Sheets

  1A—Investigate Game Animals, Hunting Seasons, and Bag Limits in Your Area
  2A—Develop a Wildlife Food Plot
  3A—Develop a Wildlife Habitat
  4A—Make Management Decisions Concerning a Deer Herd
  5A—Analyze Current Reports Concerning Wildlife Management

Suggested Activities

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Arrange for representatives of your state's wildlife department or wildlife specialists from your state's land-grant university's Cooperative Extension Service to visit the class to discuss the need for and the practice of biology-based wildlife management. **(Applying principles of biology; critical thinking; listening)**
- Arrange for hunter safety and sportsmanship training for interested students and community members.
- Discuss the cause and effect of pollution on endangered species in your state. Have students divide into two groups—one arguing for more protection of our endangered species and one arguing against government regulations and controls to protect endangered species and their natural habitats—and have them debate this topic. Have them conclude the debate and discussion with the class reaching a consensus on our responsibilities as humans in the protection of these endangered species. **(Listening; speaking; critical thinking; teamwork; negotiation)**
- Provide students with examples of deer management techniques and the consequences of over-population of deer herds. (This might best be done by a wildlife professional active in enforcement of game laws and management of your state's deer herd.) Lead the class in working through a deer management project (Assignment Sheet 4A in the advanced supplement). **(Listening; speaking; critical thinking; teamwork; applying scientific principles and methods)**

Suggested Activities

- Obtain information and supplies for food plot and wildlife habitat improvement (Assignment Sheets 2A and 3A in the advanced supplement). Contact your state's wildlife department, a game ranger, and/or a Cooperative Extension Service office for materials to help complete these activities. These projects are designed to help students learn ways to improve wildlife habitats for game and non-game animals, and to increase wildlife food supplies in areas near their school or in their community. Upon completion of these activities, have students discuss what contributions they have made to wildlife in their community. **(Reading; listening; speaking; teamwork; problem solving; applying scientific principles and methods)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.
- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.
- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet.
- Give and evaluate written test.
- Compile written-test and assignment-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- Cadieux, Charles. *These Are the Endangered.* Washington, D.C.: The Stone Wall Press, Inc., 1981.
- Camp, William G. and Thomas B. Daugherty. *Managing Our Natural Resources.* Albany, NY: Delmar Publishers Inc., 1988.
- Dietrich, Irvine. *Conservation of Natural Resources.* St. Paul, MN: Webb Publishing Co. (now Intertec).

Suggested Activities

- *Kansas Aquatics Resource Education.* Seattle, WA: 1986.
- Kircher, Harry B. *Our Natural Resources and Their Conservation*, 6th ed. Danville, IL: The Interstate Printers & Publishers, Inc., 1988.
- *Managing Forested Lands for Wildlife.* USDA, U.S. Forest Service, Rocky Mountain Region. Published by Colorado Division of Wildlife, 1984.
- *Outdoor Classrooms on School Sites.* USDA, Natural Resources Conservation Service.
- Teague, Richard D. *Wildlife Conservation*, 2nd ed. Washington, D.C.: The Wildlife Society.
- *Wildlife Identification Pocket Guide.* Seattle, WA: Outdoor Empire Publishing, Inc., 1986.
- *Wildlife Management—Restoring America's Wildlife.* Oklahoma Department of Wildlife Conservation, Project WILD.

Supplemental Resources

Print Media

- *Bird and Mammal Wall Charts.* Two sets of full-color, 20″ × 30″ wall charts showing various birds and mammals.
- *Wildlife Notes on 33 Mammals and Birds.* Pamphlets on 33 common wildlife species.

Both items above available from:

Instructional Materials Service
Cornell University
24 Roberts Hall
Ithaca, NY 14853-5901
(607) 255-3002

- Hines, Bob. *Ducks at a Distance.* Seattle, WA: Outdoor Empire Publishing, Inc., 1978.
- *Project WILD Activity Guide (Secondary).* Developed by the Western Association of Fish and Wildlife Agencies and the Western Regional Environmental Education Council. To obtain this activity guide, you must attend a Project WILD workshop. Contact your state wildlife department for more information about these workshops.

Suggested Activities

Non-print Media

Computer Software

- *Agri-Quiz: Wildlife Conservation.* Contains approximately 300 T-F and multiple choice questions for contest preparation and classroom use. For IBM-PC or Apple II families.
- *Endangered Species.* For Apple II series.

Both software are available from:

Instructional Materials Service
Cornell University
24 Roberts Hall
Ithaca, NY 14853-5901
(607) 255-3002

Films, filmstrips, and videotapes

- *The Last Chance.* 1980. 28 min. 16 mm. or video. Produced by Friends of the National Zoo. Discusses endangered species and career information about studying and working with them. Available from:

  Bull Frog Films, Inc.
  Oley, PA 19547
  (800) 543-FROG

- *Managing Wildlife: Is It For You?* Sound filmstrips exploring careers in wildlife management. Also shows how to set up a wildlife project. Available from:

  Vocational Education Productions
  CalPoly State University
  San Luis Obispo, CA 93407

- *In Celebration of America's Wildlife.* 1988. 57 min. video. Discusses efforts of last 60 years to restore wildlife populations—especially those aided through the Pittman-Robertson program. Many wildlife populations included. Available from:

  Commonwealth Films, Inc.
  1500 Brook Rd.
  Richmond, Va 23220
  (806) 558-6968

Suggested Activities

- *What is Ecology?*, 2nd ed. 21 min. 16 mm. or video. Discusses basic ecological concepts such as food chains, food webs, biotic pyramid, predators, prey, etc. Available from:

  Britannica Films and Videos
  425 N. Michigan Ave.
  Chicago, IL 60611
  (800) 558-6908

Wildlife Management
Unit 8

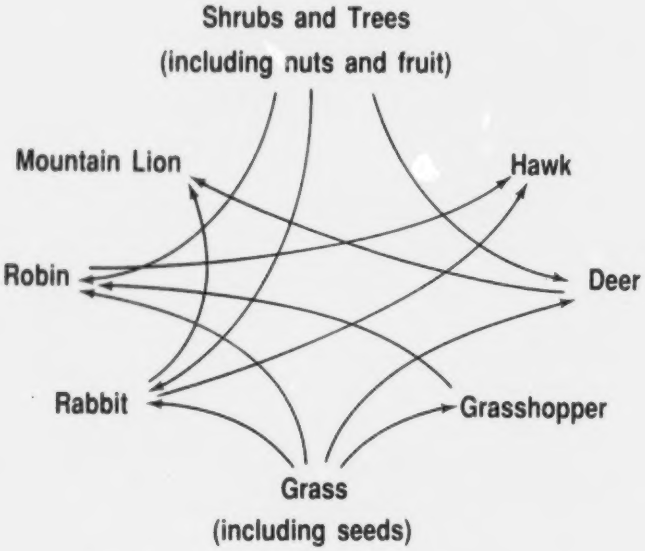
Answers to Written Test

1.

a.	12	f.	8	k.	16	p.	20
b.	14	g.	11	l.	13	q.	23
c.	7	h.	6	m.	18	r.	26
d.	3	i.	5	n.	19	s.	24
e.	4	j.	9	o.	21	t.	25

2. a. Producers
   b. Herbivores
   c. Carnivores
   d. Omnivores

3.



4. a. Are not
   b. Population
   c. Weak
   d. Exterminating

5. a. French and Native Americans
   b. loss of wildlife habitat and market hunting
   c. the late 1800s
   d. hunters and anglers
   e. raise money for waterfowl habitat
   f. Ducks Unlimited and Pheasants Forever

Answers to Written Test

6. a. 1
   b. 4
   c. 2
   d. 5
   e. 3
   f. 7

7. a. R
   b. R
   c. W
   d. W
   e. W
   f. R
   g. U
   h. W
   i. U
   j. U

8. a, d, e, f, i

9. Any four of the following:

   a. Bass
   b. Bluegill
   c. Crappie
   d. Bullhead
   e. Catfish
   f. Pike
   g. Trout
   h. Perch

10. Any eight of the following:

    a. Bat (ozark, gray)
    b. Grizzly bear
    c. Wolf (red, grey)
    d. Black-footed ferret
    e. Swift fox
    f. Jaguar
    g. Jaguarundi
    h. Whooping crane
    i. Bald eagle
    j. Woodpecker (ivory-billed, red-cockaded)
    k. Eskimo curlew
    l. Interior least tern
    m. Peregrine falcon
    n. Bonytail chub
    o. Humpback chub
    p. Leopard darter
    q. Gambusia (big bend, clear creek, pecos)
    r. Comanche pupfish
    s. Colorado River squawfish
    t. Greenback trout
    u. Central mudminnow
    v. Pearl dace
    w. Banded killfish

Answers to Written Test

11. Any five of the following:

    a. Illegal hunting
    b. Predators
    c. Starvation
    d. Droughts
    e. Storms
    f. Diseases
    g. Parasites
    h. Fires
    i. Accidents
    j. Human activities including pollution
    k. Loss of habitats through development or agriculture

12. Any three of the following:

    a. Farm around hills (contours) to control sediment that might enter and ruin ponds, lakes, and streams.
    b. Leave fence rows undisturbed to provide cover so wildlife can travel to other areas.
    c. Provide farm ponds and tanks for wildlife drinking water.
    d. Use windbreaks and shelterbelts to provide habitat for wildlife.
    e. Seed legumes and grasses to provide food cover for wildlife.
    f. Leave brush and dead (den) trees to provide nesting cover for wildlife.
    g. Prevent overgrazing on grassland to protect escape cover, nesting cover, and food for wildlife.
    h. Leave crop residue on the land to provide food for wildlife and control erosion.
    i. Provide food plot areas to keep wildlife away from crops.
    j. Maintain existing wetlands to assure future wildlife habitat.

13. a, b, d, e, g, h, i

14. Any three of the following:

    a. Reduce the number of destructive animals.
    b. Provide fencing or other mechanical barriers.
    c. Use frightening techniques.
    d. Encourage adequate game harvest by hunters.
    e. Adjust agricultural practices.
    f. Establish feeding and resting areas on noncrop lands.

15. a, b

16. a. 5
    b. 2
    c. 3 or 4
    d. 1

Answers to Written Test

17. Any four of the following:

    a. State wildlife, conservation, and natural resource departments
    b. Fish and Wildlife Service
    c. Forest Service
    d. National Park Service
    e. Natural Resources Conservation Service
    f. Corps of Engineers
    g. Bureau of Reclamation
    h. Bureau of Land Management

18. Any three of the following:

    a. Fishery biologist
    b. Hatchery manager
    c. Wildlife biologist
    d. Refuge manager
    e. Range management specialist
    f. Law enforcement
    g. Technicians (biological, fish, and wildlife)
    h. Conservationist
    i. Zoologist
    j. Writer
    k. Wildlife photographer

Wildlife Management
Unit 8

Written Test

Name ______________________ Date ______________ Score ______________

1. Match terms related to wildlife management with their definitions. Write the corresponding numbers on the blanks provided. Terms and definitions continue on next page.

______a. Animal hunted by humans for its fur, flesh, or trophy value

______b. Animals that eat plants

______c. Species not native to an area

______d. Vegetation or other material providing protection to an animal

______e. The interacting system of biological community and its nonliving environment

______f. Species that no longer exists

______g. An arrangement of interconnected food chains within an ecosystem

______h. Species that is in danger of becoming extinct through all or part of its range

______i. The transitional zone where one cover type ends and another begins

______j. An arrangement of predator-prey relationship in an ecosystem

______k. Active at night

______l. The area where an animal or plant naturally lives and grows

______m. The number of animals in a defined area

______n. Animals that hunt, kill, and consume other animals

______o. A group of organisms that resemble each other closely and that interbreed freely

______p. An area of land set aside for the protection of wildlife

1. Bag limit
2. Carnivores
3. Cover
4. Ecosystem
5. Edge
6. Endangered species
7. Exotic
8. Extinct species
9. Food chain
10. Food plot
11. Food web
12. Game animal
13. Habitat
14. Herbivores
15. Migrate
16 Nocturnal
17. Omnivores
18. Population density
19. Predators
20. Refuge, reserve, or wilderness area
21. Species

Written Test

______q.	A bird of prey	22.	Prey
______r.	Mammals, birds, and fish not domesticated	23.	Raptor
______s.	Time set aside for legal hunting or fishing	24.	Season
______t.	Areas that stand in water a significant portion of time; used by wildlife	25.	Wetlands
		26.	Wildlife

2. Complete the following statements concerning a food chain by filling in the blanks. Select your answers from the following: carnivores, herbivores, producers, omnivores.

   a. On the first level of the food chain are the "__________________."

   b. On the second level of the food chain are the "__________________."

   c. On the third level of the food chain are the "__________________."

   d. Some organisms consume food at more than one level. These are called "__________________."

3. Show the interconnections that make a food web between the following components. Draw lines with arrows pointing to the consumer (from the food source).

Shrubs and Trees
(including nuts and fruit)

Mountain Lion **Hawk**

Robin **Deer**

Rabbit **Grasshopper**

Grass
(including seeds)

4. Complete the following statements concerning the predator/prey relationship. Circle or underline the correct words.

   a. Predators (are) (are not) usually destructive.

   b. Predators can control the (genetic makeup) (population) of a prey species.

   c. Predators normally kill the (strong) (weak) individuals of the prey species.

   d. Humans are the only predators capable of (threatening) (exterminating) a prey species.

Written Test

5. Complete the following statements concerning the history of wildlife in the United States. Circle or underline the correct words.

   a. Early North America became established in the world fur trade when (settlers and New England merchants) (French and Native Americans) cooperated to trap and ship pelts.

   b. Westward expansion of settlement across the continent was responsible for (loss of wildlife habitat and market hunting) (establishments of game refuges and bag limits).

   c. The first state bag limits and laws against market hunting were established (after World War II) (the late 1800s).

   d. "The Pittman-Robertson Act and the Dingell-Johnson Act were suggested and supported by (the Sierra Club and the Nature Conservancy) (hunters and anglers).

   e. "Duck Stamps" in the U.S. and Canada were established to (raise money for waterfowl habitat restoration) (provide federal inspection of ducks and geese).

   f. The following are examples of private fund-raising organizations dedicated to improving wildlife habitat (Audubon Society and Natural Resources Defense Fund) (Ducks Unlimited and Pheasants Forever).

6. Match federal legislation with the definitions. Write the corresponding numbers on the blanks provided.

______a. Brought the federal government into the business of wildlife law enforcement

______b. Provided funding for fish management by taxing fishing and boating equipment

______c. Called for identification of fish and wildlife not taken for sport or commercial purposes

______d. Gave authority for protecting rare and endangered species to the U.S. Fish and Wildlife Service

______e. Provided funding for wildlife management by placing an excise tax on firearms and ammunition

______f. Partnership between U.S. and Canada to protect 37 species of waterfowl shared by both countries

1. Lacey Act
2. Fish and Wildlife Conservation Act
3. Federal Aid in Wildlife Restoration Act or Pittman-Robertson Act
4. Federal Aid in Sport Fish Restoration Act or Dingell-Johnson Act
5. Endangered Species Act
6. Migratory Bird Conservation Act or "Duck Stamp" Program
7. North American Waterfowl Management Plan

Written Test

7. Distinguish among major types of birds by placing the proper symbol beside the appropriate birds.

U — Upland nonmigratory   W — Wetland migratory   R — Raptor

______a. Hawk

______b. Eagle

______c. Snow goose

______d. Teal duck

______e. Mallard duck

______f. Falcon

______g. Quail

______h. Whooping crane

______i. Pheasant

______j. Wild turkey

8. Distinguish between small mammals and large mammals by placing an "X" in the blanks next to the large mammals.

______a. Bear

______b. Prairie dog

______c. Beaver

______d. Bighorn sheep

______e. Bison

______f. Elk

______g. Marmot

______h. Muskrat

______i. Moose

______j. Bobcat

______k. Rabbit

______l. Raccoon

Written Test

9. List four major fish species.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

10. List eight U.S. endangered species.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

11. List five dangers to wildlife populations.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

12. List three agricultural practices that support wildlife.

a. ______________________________

b. ______________________________

c. ______________________________

Written Test

13. Select from the following list the wildlife activities that may cause damage to agriculture. Place an "X" in the blanks next to the damaging activities.

_____a. Carry diseases

_____b. Prey on domestic livestock and poultry

_____c. Provide recreation

_____d. Feed on agricultural crops

_____e. Compete for grass on grazing lands

_____f. Provide for game hunts

_____g. Feed on stored feed supplies

_____h. Cause damage to trees

_____i. Cause damage to buildings and equipment

_____j. Provide food to hunters

14. List three ways to control wildlife damage problems.

a. ______________________________

b. ______________________________

c. ______________________________

15. Select true statements concerning public wildlife and private lands. Place an "X" in the blanks next to the true statements.

_____a. Many landowners prefer to see wildlife on their land.

_____b. Wildlife share with domestic animals the farm habitat including food, shelter, and space.

_____c. Most state and federal wildlife agency money is spent on private lands.

_____d. Many landowners receive compensation for good land management practices from the Department of Land Management.

_____e. About 20% of game wildlife is harvested on private land.

Written Test

16. Match the types of private wildlife production areas with their descriptions. Write the corresponding numbers on the blanks provided.

______a. Raise and sell wildlife animals, birds, and fish or sell hunting leases

______b. Areas set aside exclusively for owners and members

______c. Provide "package hunts"

______d. Landowners open their land in exchange for protection against random trespassing

1. Cooperatives
2. Preserves
3. Commercial wildlife enterprises
4. Exotic and native big game ranches
5. Farms

17. List four government agencies involved in wildlife management.

a. ________________________________

b. ________________________________

c. ________________________________

d. ________________________________

18. List three career opportunities related to wildlife management.

a. ________________________________

b. ________________________________

c. ________________________________

***Permission to duplicate this test is granted.**

Wildlife Management
Unit 8

Unit Evaluation Form

Student Name ______________________________ Unit Rating ____________

Assignment Sheet Ratings

Assignment Sheet 1—Explain Effects on a Food Chain When Parts Are Removed Rating ______

Comments: ____

____

Assignment Sheet 2—Create a Food Web Rating ______

Comments: ____

____

Assignment Sheet 3—List Fish and Wildlife in Your Area Rating ______

Comments: ____

____

Assignment Sheet 4—Identify Wildlife You See in a Certain Time Span Rating ______

Comments: ____

____

Assignment Sheet 5—Compile a Profile of a Wildlife Species Rating ______

Comments: ____

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Investigate Game Animals, Hunting Seasons, and Bag Limits in Your Area Rating ______

Comments: ____

____

Unit Evaluation Form

Assignment Sheet 2A—Develop a Wildlife Food Plot Rating ______

Comments: ____________________

____

Assignment Sheet 3A—Develop a Wildlife Habitat Rating ______

Comments: ____________________

____

Assignment Sheet 4A—Make Management Decisions
Concerning a Deer Herd Rating ______

Comments: ____________________

____

Assignment Sheet 5A—Analyze Current Reports
Concerning Wildlife Management Rating ______

Comments: ____________________

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____________________

____

Teacher Signature ____________________ Date ____________

Student Signature ____________________ Date ____________

***Permission to duplicate this form is granted.**

Food Chains

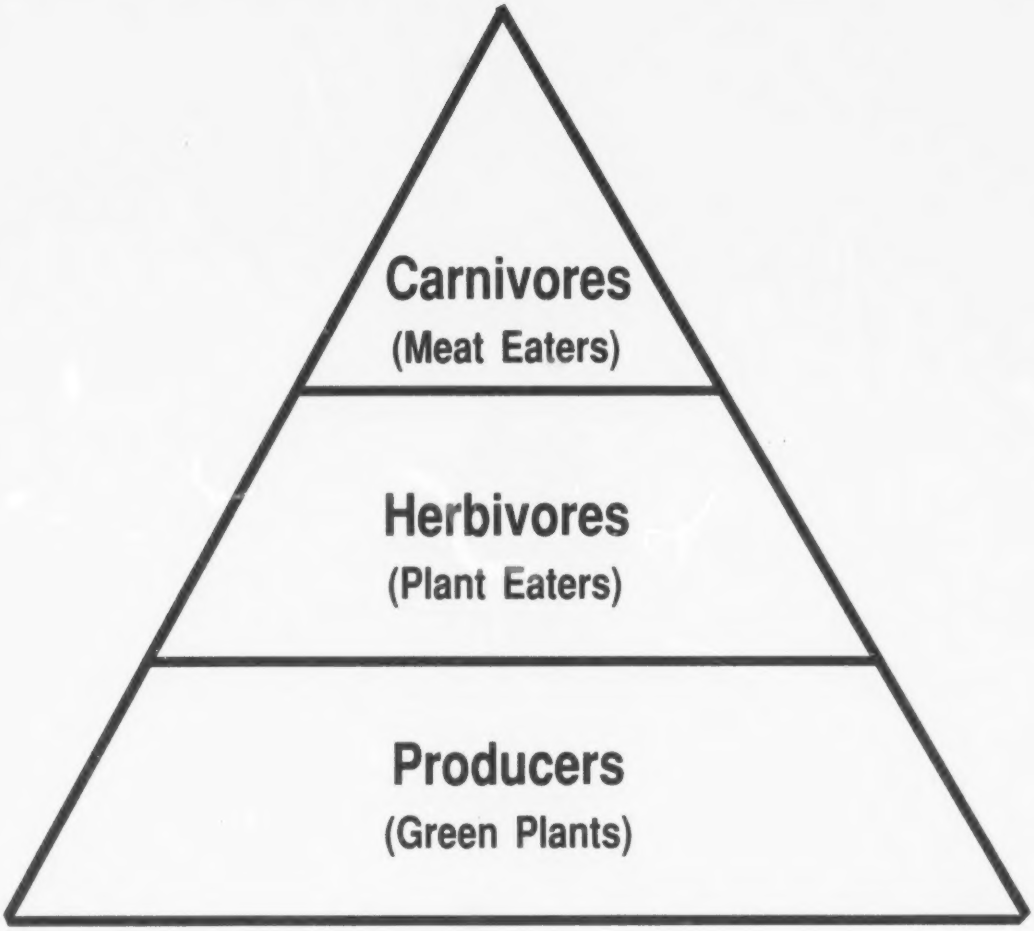
Grass → Grasshopper → Frog

Snake → Hawk

Grass, Tree Leaves → Deer → Mountain Lion

Grass → Mouse → Owl → Hawk

Biotic Pyramid



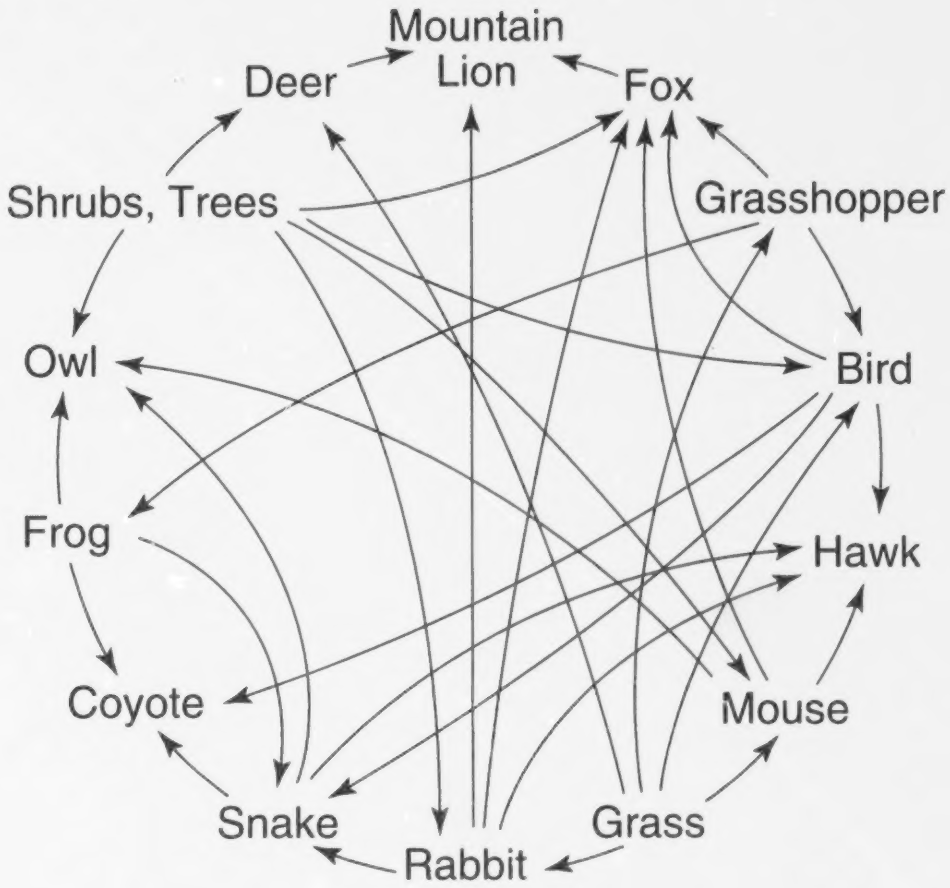
Carnivores
(Meat Eaters)

Herbivores
(Plant Eaters)

Producers
(Green Plants)

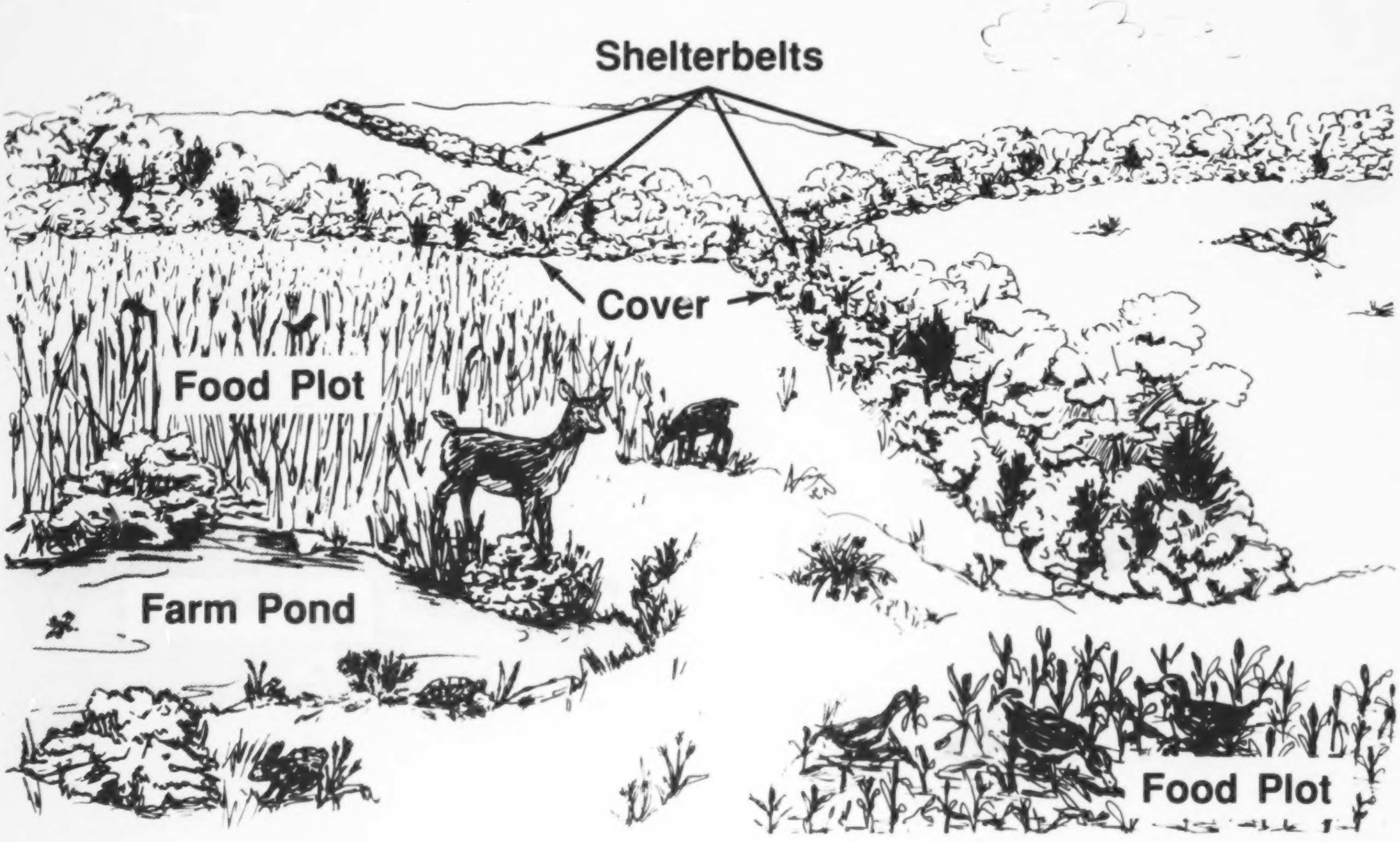
Note: A pyramid shape is often used to show the food chain concept because a great many more producers are required to support herbivores, and more herbivores are needed to support carnivores. Omnivores can occupy both the middle and top levels in the pyramid depending on their food source at the time.

Food Web



Note: Arrows point to the consumer.

Agricultural Practices That Support Wildlife



Wildlife Habitats
Unit 9

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain various resources such as films, videotapes, water test kits, laboratory equipment, and other materials to supplement instruction of this unit.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Components of a Habitat (Objective 2)
  TM 2—Habitat Improvement (Objective 5)
  TM 3—Habitat Improvement (Continued) (Objective 5)
  TM 4—Habitat Destruction (Objective 7)
  TM 5—Lakes, Ponds, and Pothole Habitats (Objective 9)
  TM 6—River and Stream Habitats (Objective 10)
  TM 7—Wetland Habitat (Objective 11)
  TM 8—Woodland Habitat (Objective 12)
  TM 9—Rangeland Habitat (Objective 13)
  TM 10—Farmland Habitat (Objective 14)
  TM 11—Urban Habitat (Objective 15)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements and assignments, and plan presentation.

Suggested Activities

Advanced Student Supplement

1A—List of Wildlife Foods

Advanced Assignment Sheets

1A—Survey Non-Game Birds at a Feeding Station
2A—Survey Wildlife Foods
3A—Survey for Wildlife Signs
4A—Develop a Management Plan for a Farm Pond for Sport Fishing
5A—Analyze Current Reports Concerning Wildlife Habitats

Advanced Job Sheets

1A—Construct Nesting Sites
2A—Increase Hummingbird Habitat

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets and job sheets. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Arrange for representatives of your state's wildlife department or wildlife specialists from your state's land-grant university's Cooperative Extension Service to visit the class to discuss the need for and the practice of biology-based wildlife management and habitat maintenance and improvement. This visit, and continued cooperation of the various wildlife experts, is very important to this unit's activities, especially the advanced sections. The individual or individuals called upon to visit the class will also be asked to provide technical information from their various agencies concerning wildlife habitat improvement, species selection, and farm pond management.

Suggested Activities

- Meet with and enlist local land and property owners who would allow class members to use their property to survey wildlife species, food sources, habitat conditions, etc. This is particularly important for advanced assignments such as non-game bird surveys and wildlife food surveys.

- Obtain copies of the 4-H Wildlife Habitat Evaluation Handbook from your land-grant university's Cooperative Extension office. Encourage students to find their locale within this book's regions and assign them a report on various species found locally and their habitat needs. **(Comprehending written information; analyzing and applying what has been read to a specific task; writing; critical thinking)**

- Have your students work with a science or biology class to accomplish a group project such as construction of bluebird trails, fish shelters, or other habitat enhancing project. **(Organizational effectiveness; teamwork; leadership; applying scientific techniques)**

- Encourage class members to consider their own homes, yards, acreages, and farms as "laboratories" for the class to study and improve wildlife habitat. Seek cooperation from class members' parents in providing areas where class projects can be accomplished.

- Invite members of Quail Unlimited, Ducks Unlimited, or Pheasants Forever, to address the class about habitat improvement activities their organizations have been involved with. Suggest they bring audio-visual or printed material to reinforce their presentations. **(Listening)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.

- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."

- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.

- Give and evaluate written test.

Suggested Activities

- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Suggested Activities

Suggested Resources

Resources Used in Developing This Unit

- Camp, William G. and Thomas B. Daugherty. *Managing Our Natural Resources.* Albany, NY: Delmar Publishers Inc., 1988.
- Cooperrider, Allen Y. *Inventory and Monitoring of Wildlife Habitat.* U.S. Department of Interior, Bureau of Land Management Service Center, Denver, CO, 1986.
- Dietrich, Irvine. *Conservation of Natural Resources.* St. Paul, MN: Webb Publishing Co., (now Intertec).
- *Making Land Produce Useful Wildlife*, Farmer's Bulletin No. 2035. U.S. Department of Agriculture.
- *More Wildlife Through Soil and Water Conservation*, Agriculture Information Bulletin, No. 175. Natural Resources Conservation Service.
- *The Audubon Society Field Guide to North American Birds* (Western Region). New York, NY: Alfred A. Knopf, 1992.
- *Wildlife Habitat Improvement Handbook:* Forest Service Handbook. U.S. Department of Agriculture.
- *Wildlife Habitat Evaluation Handbook.* National 4-H Council, 7100 Connecticut Ave., Chevy Chase, MD 20815, 1991.

Supplemental Resources

Print media

- *Basic Field Techniques in Wildlife Management.* Columbus, OH: Agricultural Education Service.
- Kircher, Harry B. *Our Natural Resources and Their Conservation*, 6th ed. Danville, IL: The Interstate Printers & Publishers, Inc., 1988.
- White, Paul F. *Fish and Wildlife Management.* Jefferson City, MO: Missouri Department of Conservation, 1989.

Nonprint media

- *America's Wetlands*, A05875/PY. 28 min.. 16mm film and ½", ¾", and Beta videotapes. Developed by the U.S. Department of the Interior, Fish and Wildlife Service. Discusses the value of America's wetlands to humans and wildlife.

Suggested Activities

- *Habitat—A Special Place*, A01929/PY. 28 min.. 16mm and ½", ¾", and Beta videotapes. Developed by the U.S. Department of Agriculture. Explores a variety of native environments to learn about "habitats."

  America's Wetlands and *Habitat—A Special Place* are available from:

  National Audiovisual Center
  National Archives and Records Administration
  Customer Services Section PY
  8700 Edgeworth Drive
  Capitol Heights, MD 20743-3701
  (301) 763-1896

- *Estuary*. 12 min.. 16mm film or video. Produced by the National Film Board of Canada. Details the complex ecology of estuarine life and the importance of wetlands. Available from:

  Bull Frog Films, Inc.
  Oley, PA 19547
  (800) 543-FROG

- *Urban Wildlife*. 20 min. ½" and ¾" video. Discusses co-existence of wild animals and humans in an urban environment. Available from:

  Centre Production, Inc.
  Distributed by Barr Films
  12801 Schabarum Avenue
  P.O. Box 7878
  Irwindale, CA 91706-7878
  (818) 338-7878

- Computer software — *Wildlife Series: Limiting Factors and Carrying Capacity*. Relates habitat, wildlife, human effects, and students' personal values. For Apple II (DOS 3.3). Available from:

  Instructional Materials Service
  Cornell University
  24 Roberts Hall
  Ithaca, NY 14853-5901
  (607) 255-3002

Wildlife Habitats
Unit 9

Answers to Assignment Sheets

Assignment Sheet 1—Layout and Identify Ways to Improve a Local Habitat

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 2—Identify Ways to Improve a Wetland Habitat

1. Provide a dependable water supply.
2. Control water levels.
3. Protect from too much grazing that can destroy valuable food and cover.
4. In wetlands that are overgrown, provide open areas by removing vegetation in 50-foot wide strips.

Assignment Sheet 3—Determine the Carrying Capacity of a Pond

1. 50 pounds per acre
2. 10 pounds per acre
3. 400 1/2 pound bluegills

Assignment Sheet 4—Determine the Carrying Capacity of a Rangeland Habitat

1. 100
2. 200
3. 300
4. 400
5. 400

Wildlife Habitats
Unit 9

Answers to Written Test

1. a. 22
   b. 20
   c. 17
   d. 5
   e. 11
   f. 1
   g. 21
   h. 14
   i. 13
   j. 2
   k. 18
   l. 19
   m. 16
   n. 7
   o. 10

2. a. 2
   b. 4
   c. 3
   d. 1

3. a. To maintain a quality habitat as it exists in a natural ecosystem
   b. To improve a habitat where it has deteriorated or where a specific habitat component is lacking

4. a, c, d

5. a. 2 or 5
   b. 1
   c. 9
   d. 4
   e. 7
   f. 6
   g. 3

6. a. W
   b. W
   c. C
   d. C
   e. F
   f. F
   g. C
   h. W
   i. C
   j. W

7. Any four of the following:

   a. Overgrazing
   b. Mining
   c. Recreational activities
   d. Construction
   e. Logging
   f. Roads
   g. Chemicals

8. a. 1
   b. 6
   c. 7
   d. 4
   e. 5
   f. 3

Answers to Written Test

9. a. Deep
   b. Shallow
   c. (1) Livestock
      (2) Watershed
      (3) Basin
      (4) Shallow

10. b, c, d, g

11. a. Increase
    b. More
    c. Much
    d. 50

12. a. Preferred
    b. Snags
    c. Openings
    d. (1) Avoided
       (2) Piled near edge

13. a, c, f

14. c, f

15. a, c

Wildlife Habitats
Unit 9

Written Test

Name ______________________ Date ______________ Score __________

1. Match terms related to wildlife habitats with their definitions. Write the corresponding numbers on the blanks provided. Terms and definitions continued on next page.

______ a. The area an animal will defend

______ b. The process by which fish deposit eggs

______ c. Thinning of old shrub growth to allow new growth

______ d. The leaves, shoots, and twigs of trees and shrubs available for animal consumption

______ e. The area where a plant or animal naturally lives and grows

______ f. Simple, free-floating water plants

______ g. The progressive development of vegetation which replaces one plant community with another in order to reach a climax condition

______ h. Nuts of trees and shrubs which are used as food by animals

______ i. Factors that restrict the population potential of a species

______ j. Growing or living in or upon water

______ k. A shallow area in a stream that causes broken water

______ l. The area along the bank of a natural watercourse

______ m. Suspended, floating, microscopic plants and animals in the water

______ n. The maximum number of animals that an area can support

______ o. A general name for any fleshy-leafed plant, other than grass, which is found in grasslands and open woodlands

1. Algae
2. Aquatic
3. Biomass
4. Buffer strip
5. Browse
6. Canopy
7. Carrying capacity
8. Deflector
9. Edge
10. Forb
11. Habitat
12. Home range
13. Limiting factors
14. Mast
15. Mitigate
16. Plankton
17. Release cut
18. Riffles
19. Riparian land
20. Spawning
21. Succession
22. Territory

Written Test

2. Match the components of a habitat with their descriptions. Write the corresponding numbers on the blanks provided.

______a. Provides nutrients for growth, maintenance, and reproduction

______b. Needed for blood composition, to regulate body temperature, and to provide nutrient transport throughout the body

______c. Amount of area that an animal uses to locate its basic requirements

______d. Vegetation and other material providing protection for the animal

1. Cover
2. Food
3. Space
4. Water

3. List the objectives of wildlife habitat management.

a. ____

____

b. ____

____

4. Select true statements concerning habitat management principles. Place an "X" in the blanks next to the true statements.

______a. Wildlife research helps to determine the habitat requirements of specific wildlife.

______b. Most species require the same type of habitat.

______c. When the basic components of a habitat are abundant and ideal, the animal species will reach its maximum (biotic) potential.

______d. Environmental factors limit the potential of an animal species population.

______e. All land has the same carrying capacity for all animal species.

______f. Surplus animals always die.

______g. When habitat conditions change, the type and amount of wildlife present remain the same.

______h. Wildlife species can be maintained only by moving them to more suitable habitats.

Written Test

5. Match common tools and techniques of habitat improvement with their uses. Write the corresponding numbers on the blanks provided.

_____a. Provide a habitat for fish as well as a watering place for other wildlife

_____b. Used to change the composition of the water or soil either to encourage or discourage various plant and animal species

_____c. Provide nesting places for species whose natural habitat has been damaged

_____d. Established to provide a change between types of cover

_____e. Planted to provide food and cover habitat

_____f. Used to protect water and its bank from contamination or damage by domestic animals

_____g. Used to control the direction of stream flow

1. Chemicals
2. Dams
3. Deflectors
4. Edges
5. Farm ponds
6. Fences
7. Food plots
8. Heavy equipment
9. Nesting structures
10. Shelterbelts

6. Classify actions taken to improve wildlife habitats according to those that would improve food, water, or cover components. Place the following symbols next to the appropriate actions:

- F — Food improvements
- W — Water improvements
- C — Cover improvements

_____a. Deepen existing water-holding basins

_____b. Build dams

_____c. Provide artificial nest structures

_____d. Build artificial roosts or reefs

_____e. Increase mast or fruit production

_____f. Plant plots of grasses and legumes

_____g. Protect from excessive grazing, fires, and mowing

_____h. Add tanks, troughs, or wells

_____i. Maintain existing dens or nesting trees

_____j. Create potholes

Written Test

7. List four causes of habitat destruction.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

8. Match types of wildlife habitats with the descriptions. Write the corresponding number on the blanks provided.

   ______a. Land used for agricultural practices

   ______b. Land where the water table is usually at or near the surface or the land is covered by shallow water

   ______c. Land used primarily for growing trees and shrubs

   ______d. Bodies of running water

   ______e. Land predominantly occupied by man-made structures used for residential, commercial, and industrial purposes

   ______f. Land where natural vegetation is mostly grasses, forbs, and shrubs

   1. Farmland
   2. Lakes, ponds, and potholes
   3. Rangeland
   4. Rivers and streams
   5. Urban
   6. Wetland
   7. Woodland

9. Complete the following statements concerning lakes, ponds, and pothole habitats by circling or underlining the correct words.

   a. The (shallow) (deep) water supports plankton and carnivorous fish.

   b. The (shallow) (deep) water contains aquatic vegetation and diverse aquatic populations.

   c. Ways to protect these habitats include the following:

      (1) Fence shoreline to control (livestock) (birds) from using it for watering.

      (2) Control erosion in the (watershed) (mountains).

      (3) Reduce sediment draining into the lake by providing a sediment (filter) (basin) for all feeder streams.

      (4) Control weeds in (shallow) (deep) areas.

Written Test

10. Select true statements concerning river and stream habitats. Place an "X" in the blanks next to the true statements.

______a. The best streamflow pattern is an intermittent flow of water with heavy spring runoff.

______b. A certain amount of water is needed to maintain stream habitat.

______c. Eroding streambanks allow sediment to ruin the streambed.

______d. Riffles provide food and spawning areas for fish, and hunting areas for predators such as racoons and bears.

______e. Riparian areas are breeding areas for pests and should be chemically destroyed.

______f. Cooler temperatures allow less dissolved oxygen for fish.

______g. Fence to protect these habitats from livestock grazing and watering.

11. Complete the following statements concerning wetland habitats by circling or underlining the correct answers.

    a. The high concentration of nutrients in wetlands helps to (increase) (decrease) the productivity of vegetation.

    b. Larger wetland areas tend to provide (more) (less) diverse habitat for more types of wildlife.

    c. Protect area from too (little) (much) grazing that can destroy valuable food and cover.

    d. In wetlands that are overgrown, provide open areas by removing vegetation in (50) (100) foot wide strips.

12. Complete the following statements concerning woodland habitats by circling or underlining the correct words.

    a. Edges are (avoided) (preferred) by large numbers of wildlife.

    b. Dead or partly dead trees are called (snags) (stumps).

    c. Areas that do not support trees but provide a source of diversity within the forest are called (canopies) (openings).

    d. To protect these habitats,

        (1) Overgrazing should be (avoided) (allowed).

        (2) Brush should be (piled near edge) (disposed of).

Written Test

13. Select true statements concerning rangeland habitats. Place an "X" in the blanks next to the true statements.

_____a. The subsurface layer includes the area suitable for burrow or tunnel construction.

_____b. The midstory layer includes short, mid, and tall grass species.

_____c. Rangelands should be protected from unwanted fires.

_____d. Allow free grazing in marshy rangeland.

_____e. Clear the land of all brush and shrubs.

_____f. Build ponds for watering.

14. Select true statements concerning farmland habitats. Place an "X" in the blanks next to the true statements.

_____a. Components of the farmland habitat include cropland, pasture, and woodland.

_____b. Allow wildlife areas to be grazed by domestic animals.

_____c. Seed marginal lands to grasses.

_____d. Drain farm ponds.

_____e. Allow overgrazing of pastures.

_____f. Restrict clean mowing of pastures and fence rows.

15. Select true statements concerning urban habitats. Place an "X" in the blanks next to the true statements.

_____a. The basic components of an urban habitat include buildings, utilities, transportation, people, and pets.

_____b. One way to protect these habitats is to remove trees and shrubs.

_____c. Steady water sources should be provided.

***Permission to duplicate this test is granted.**

Wildlife Habitats
Unit 9

Unit Evaluation Form

Student Name ______________________________ Unit Rating ______________

Assignment Sheet Ratings

Assignment Sheet 1—Layout and Identify Ways to Improve a Local Habitat Rating ______

Comments: ______________________________

____

Assignment Sheet 2—Identify Ways to Improve a Wetland Habitat Rating ______

Comments: ______________________________

____

Assignment Sheet 3—Determine the Carrying Capacity of a Pond Rating ______

Comments: ______________________________

____

Assignment Sheet 4—Determine the Carrying Capacity of a Rangeland Habitat Rating ______

Comments: ______________________________

____

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Survey Non-Game Birds at a Feeding Station Rating ______

Comments: ______________________________

____

Assignment Sheet 2A—Survey Wildlife Foods Rating ______

Comments: ______________________________

____

Unit Evaluation Form

Assignment Sheet 3A—Survey for Wildlife Signs Rating ______

Comments: ______________________________

____

Assignment Sheet 4A—Develop a Management Plan for a Farm Pond for Sport Fishing Rating ______

Comments: ______________________________

____

Assignment Sheet 5A—Analyze Current Reports Concerning Wildlife Habitats Rating ______

Comments: ______________________________

____

Job Sheet Ratings

Job Sheet 1A—Construct Nesting Sites Rating ______

Comments: ______________________________

____

Job Sheet 2A—Increase Hummingbird Habitat Rating ______

Comments: ______________________________

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ______________________________

____

Teacher Signature ______________________ Date ____________

Student Signature ______________________ Date ____________

***Permission to duplicate this form is granted.**

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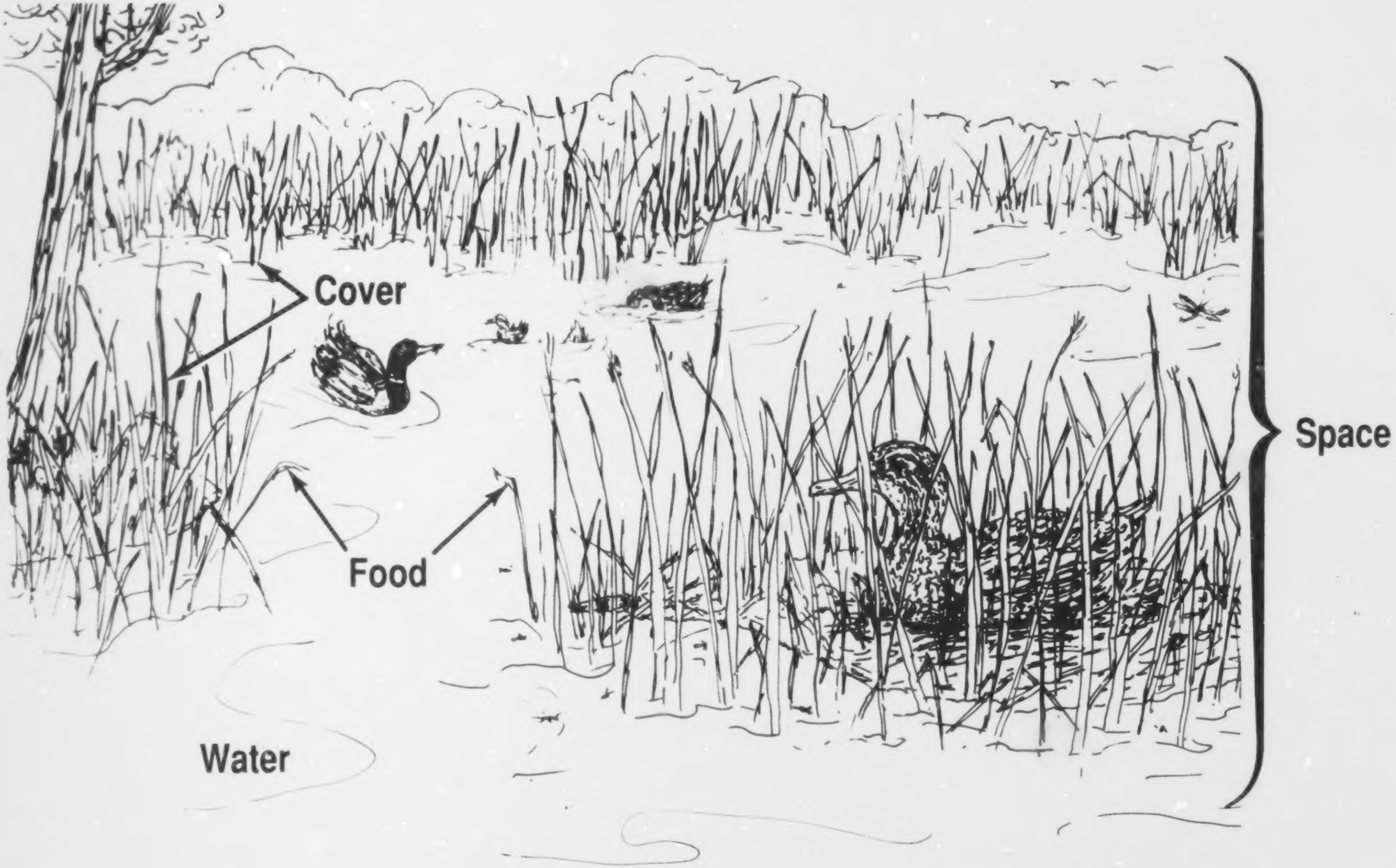
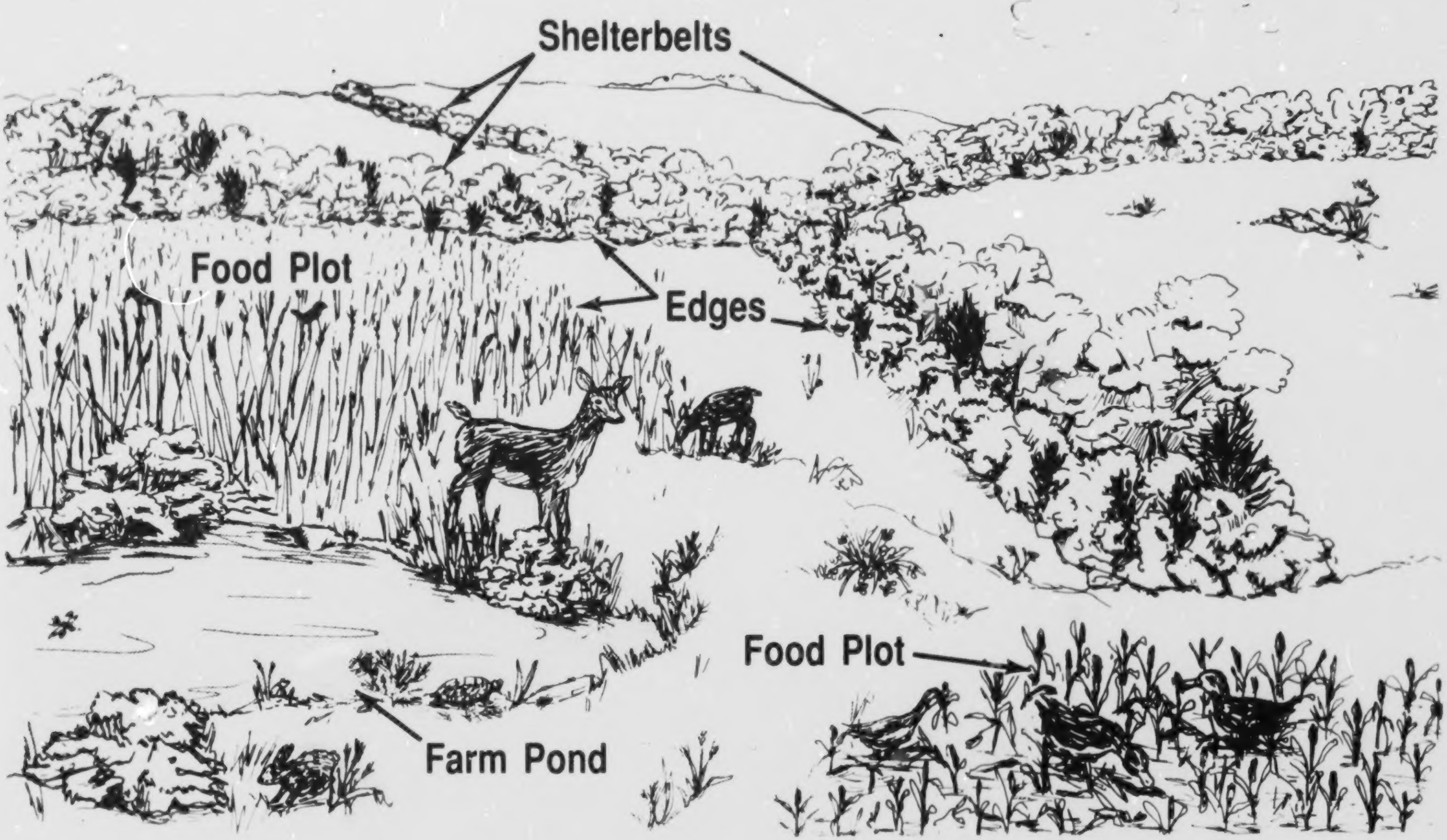
Components of a Habitat



Habitat Improvement



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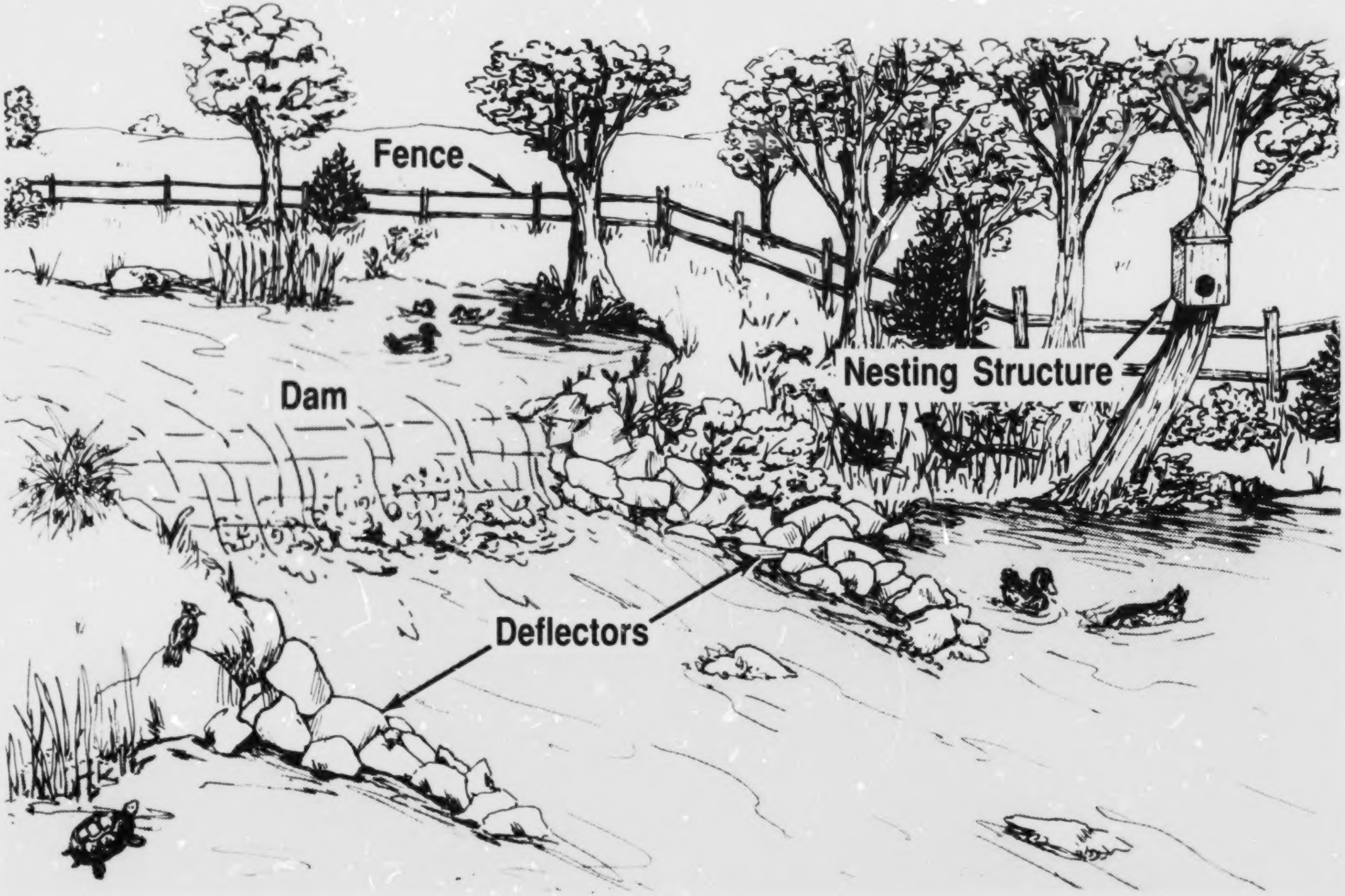
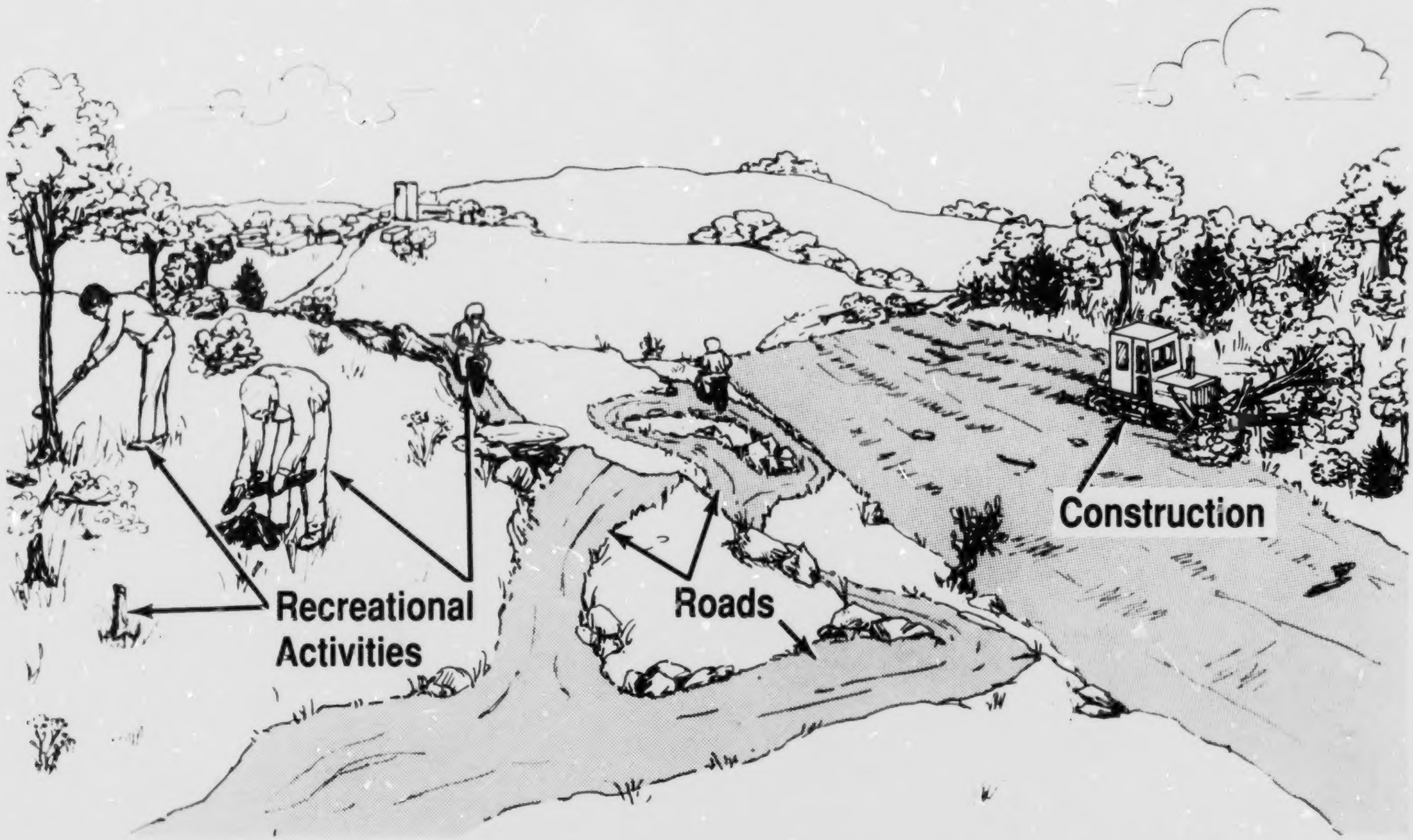
Teacher Page 21

TM 2

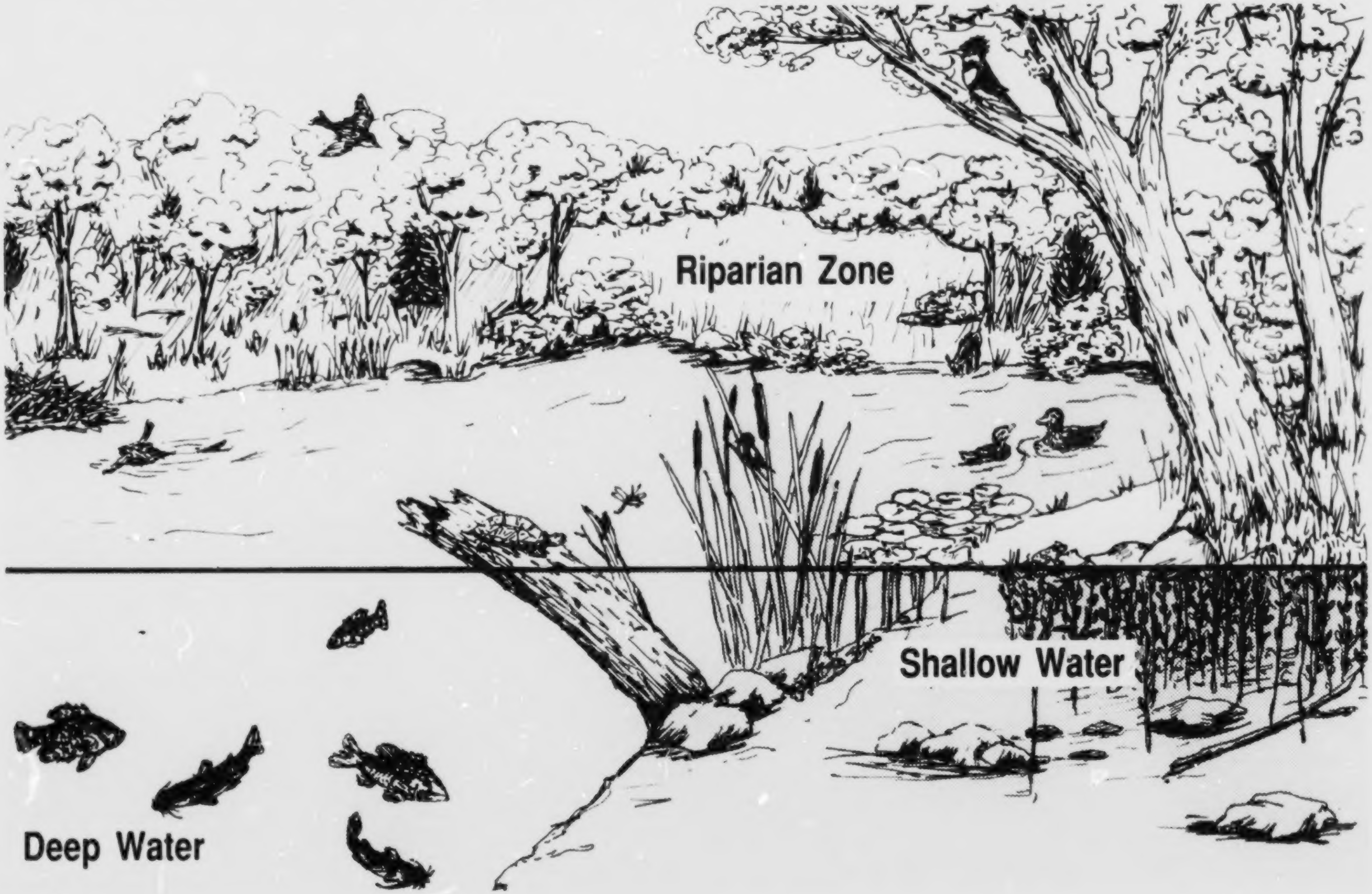
Habitat Improvement (Continued)



Habitat Destruction



Lakes, Ponds, and Pothole Habitats



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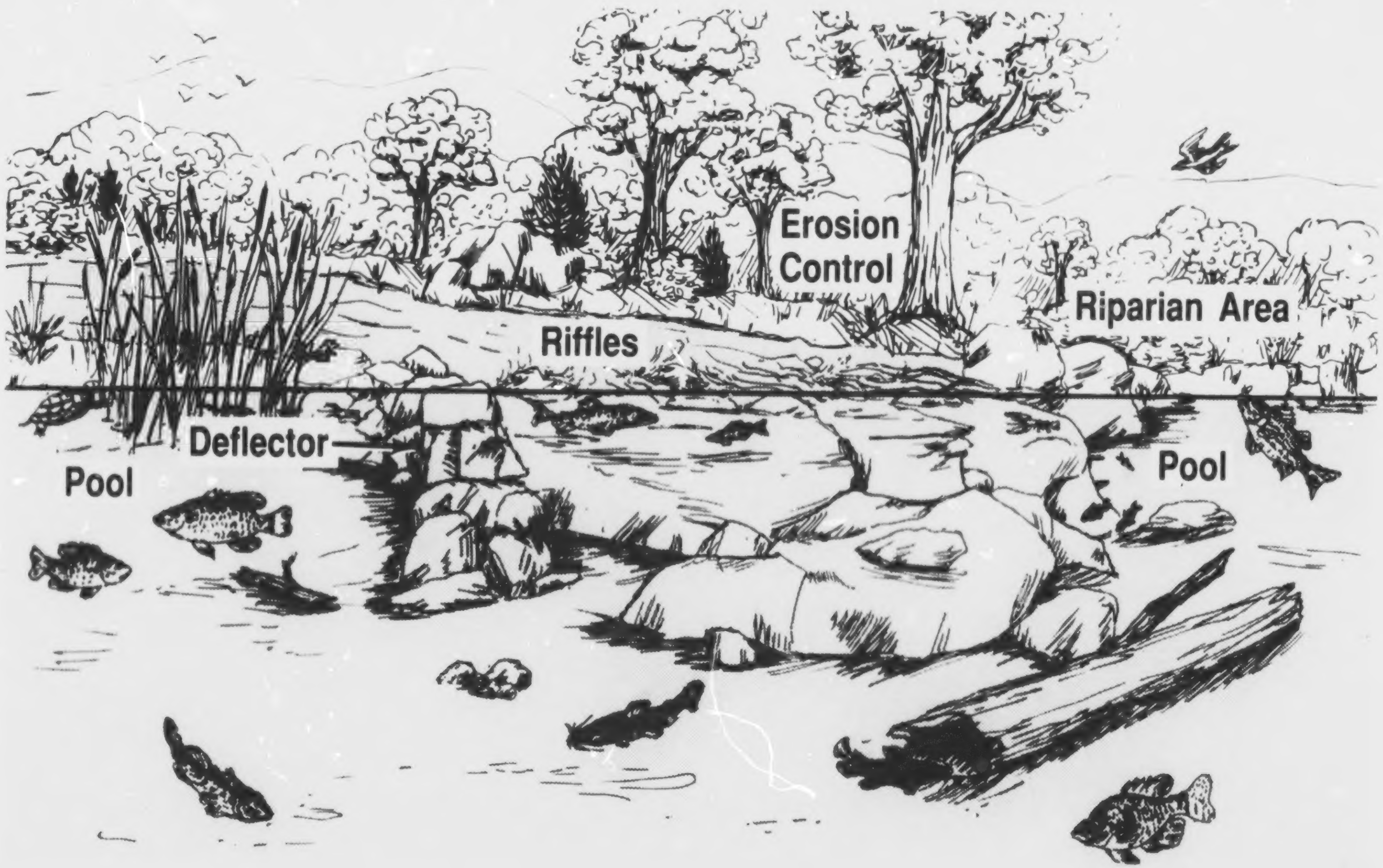
Teacher Page 27

TM 5

River and Stream Habitats



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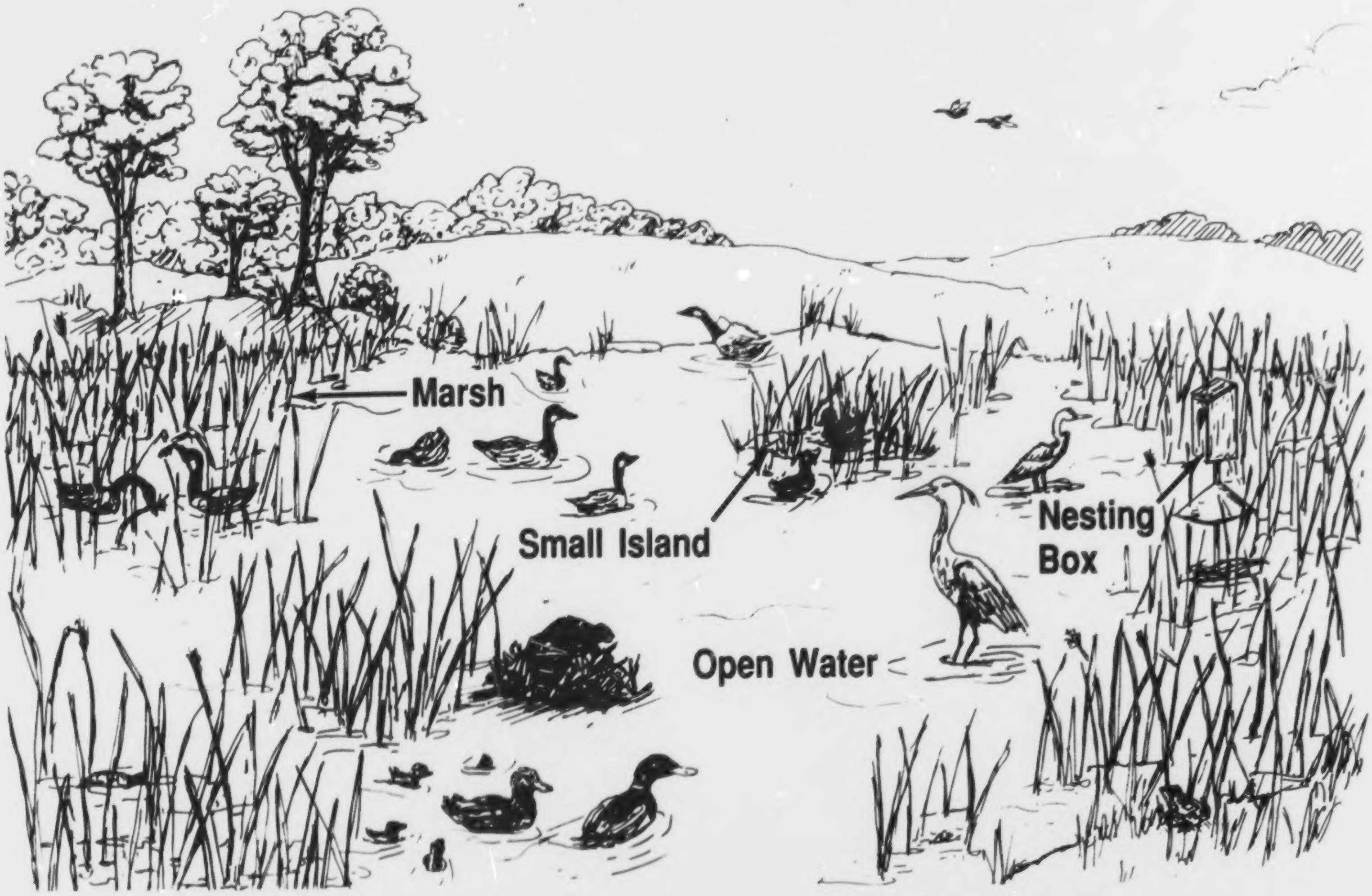
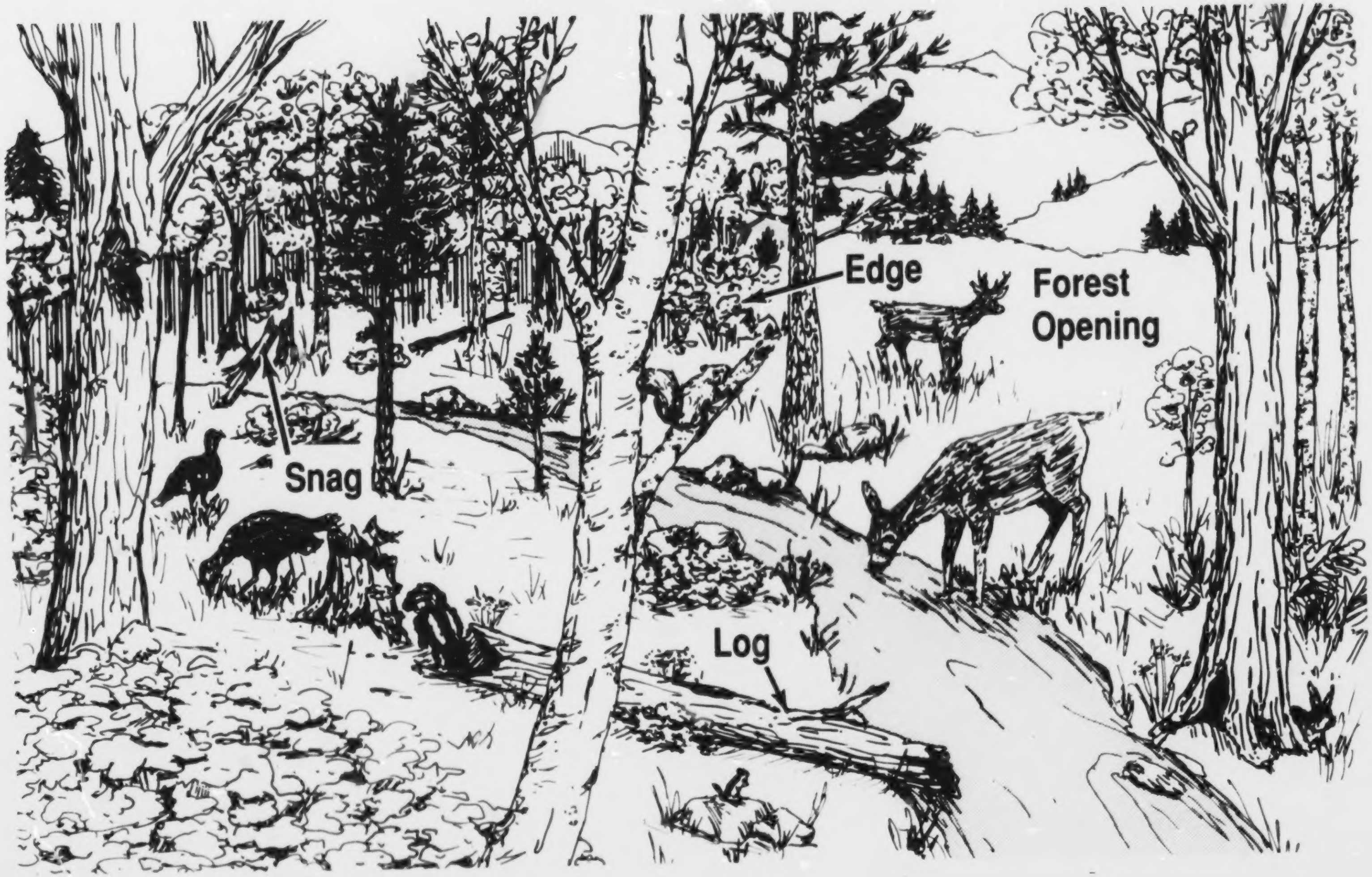
Teacher Page 29

TM 6

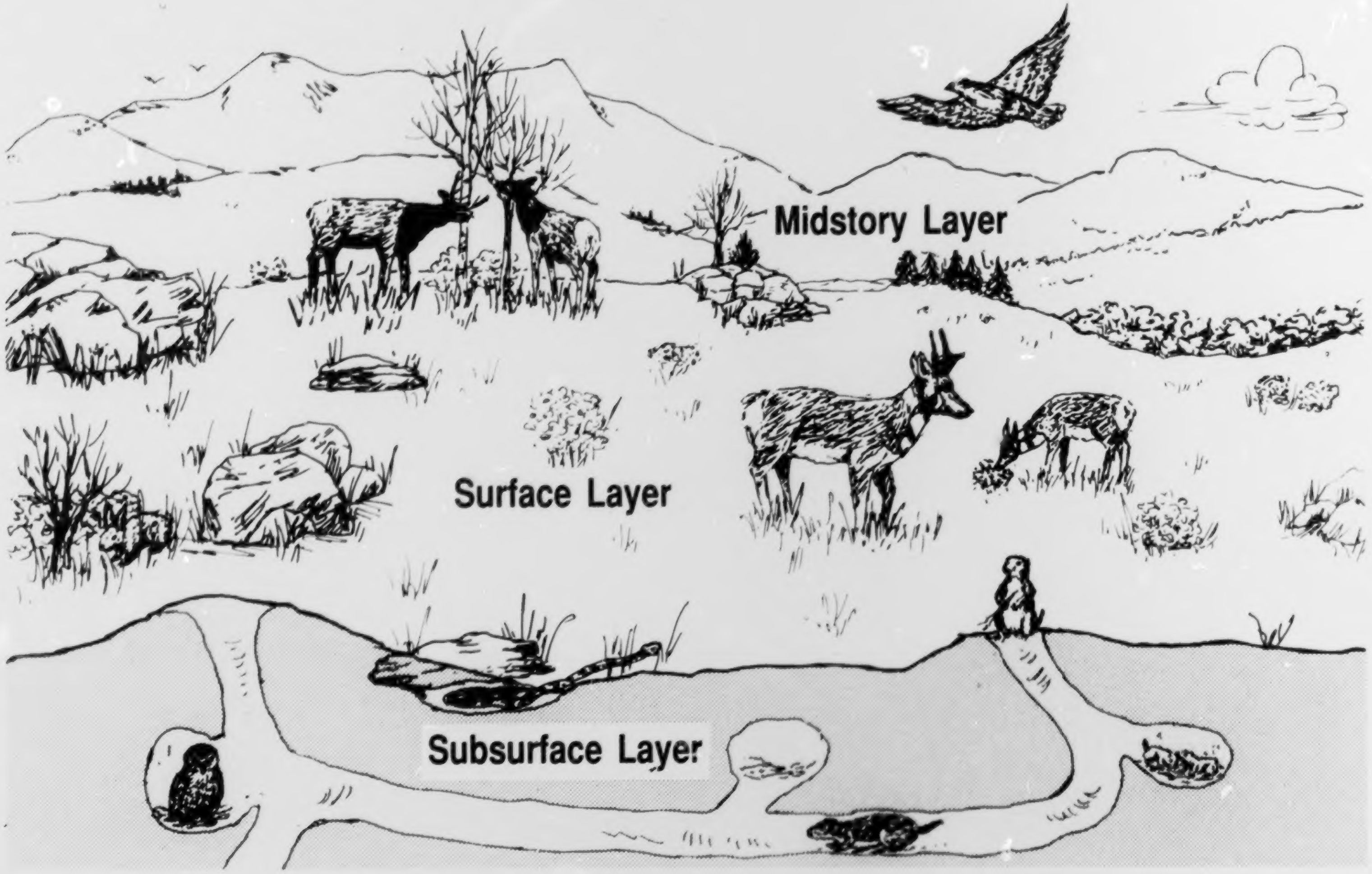
Wetland Habitat



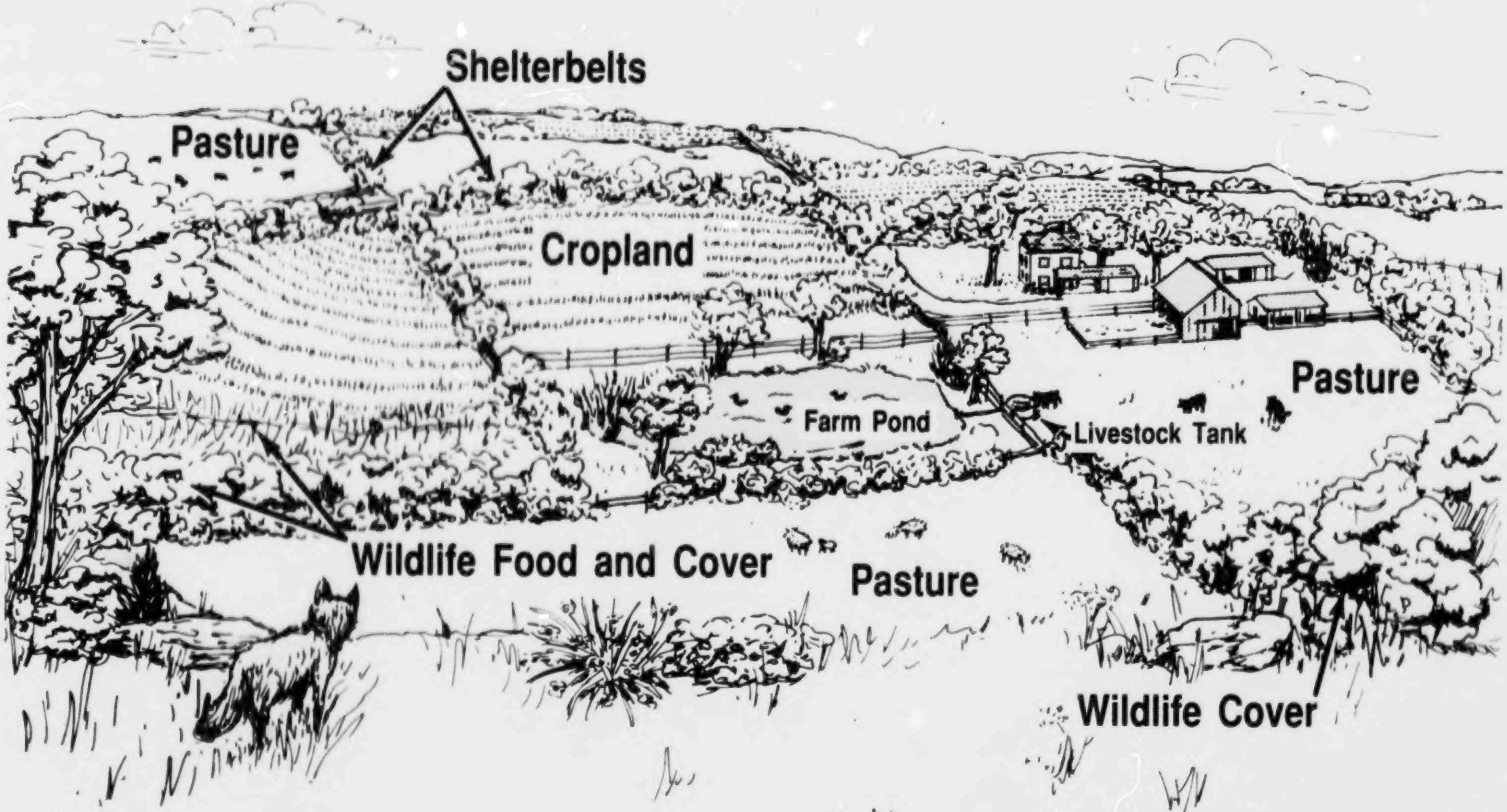
Woodland Habitat



Rangeland Habitat



Farmland Habitat



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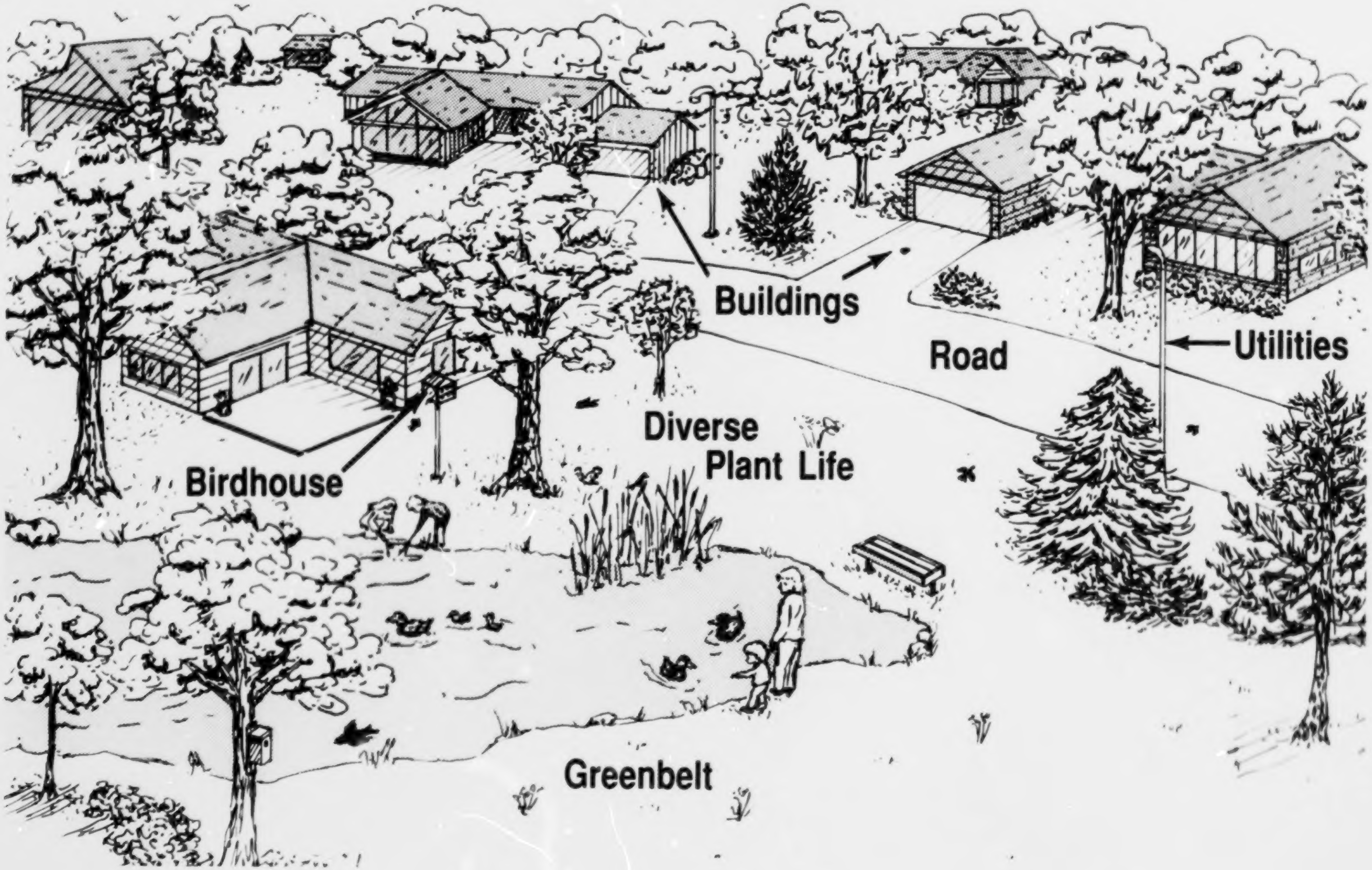
Teacher Page 37

TM 10

Urban Habitat



Outdoor Recreation
Unit 10

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Also note the suggestions for media and supplemental materials.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.

- Make transparencies from the transparency masters included in this unit. These appear in the teacher edition only and should be used with objectives as indicated below.

  TM 1—Why Do People Enjoy These Activities? (Objective 2)
  TM 2—Why Do People Enjoy These Activities? (Continued) (Objective 2)
  TM 3—Why Do People Enjoy These Activities? (Continued) (Objective 2)
  TM 4—Career Opportunities in Outdoor Recreation (Objective 9)

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Review the advanced applications supplement. Select optional student supplements, assignment sheets, and job sheet, and plan presentation.

  Advanced Student Supplements

  1A—The Dakota Fire Hole
  2A—Friends in the Night Sky

Suggested Activities

Advanced Assignment Sheets

1A—Develop a Historical Presentation for Visitors to Your Area
2A—Evaluate Conflict Resolution Scenarios
3A—Give Accurate, Easy-to-Follow Directions
4A—Locate Constellations in the Night Sky
5A—Analyze Current Reports Concerning the Growth of Outdoor Recreation and Its Effects on the Environment

Advanced Job Sheet

1A—Build a Wood-Conserving Dakota Fire Hole

Delivery and Application

Unit Introduction

- Discuss unit and specific objectives.
- Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
- Discuss the assignment sheets and job sheet. Determine if you wish the students to work as individuals or teams on the various assignment sheets and job sheet. Review with students the criteria for evaluation of each of these activities.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified in *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

- Invite guest speakers to discuss with the class their occupations, skills, and education required, and possibly demonstrate a specific skill or safety procedure associated with their occupations. **(Listening; career awareness)**

  Choose from the following as time allows:

  —Park ranger
  —Lake ranger
  —Game warden
  —Entertainment manager
  —Outdoor guide
  —Fish farmer
  —Campground owner
  —Qualified life guard
  —Recreation manager
  —Instructor
  —First aid/safety expert
  —Business owner
  —Banker
  —Youth camp owner/operator
  —Owner of a riding stable

Suggested Activities

- Videotape the students giving oral presentations in Assignment Sheet 2. Students should view these so they can work on improving their speaking and presentation skills. **(Listening; problem solving)**

- Visit a large park or recreational area, and tour the facility with a park manager, ranger, or park employee. You might want to tie this in with Assignment Sheet 4. **(Listening; speaking; acquiring technical information)**

- If facilities are available, teach students to:

  —Saddle and care for a horse
  —Paddle a canoe
  —Set up a camp site
  —Prepare for a hiking trip
  —Use a compass (Orienteering)
  —Maintain grounds with power mower, string trimmer, farm tractor, and brush hog
  —Clean up a park area and facilities

- Have students "adopt" a local park as a class or student organization, and have them assist in making improvements. **(Leadership; teamwork; problem solving)**

- After students complete Assignment Sheet 6, have them work in groups and conduct additional research on one local employer. Have them determine their number of seasonal, full-time, and part-time employees, as well as the education and skills required or preferred for employment. **(Career awareness; teamwork; speaking; listening; acquiring information from existing sources)**

- Arrange an overnight class/field camping trip where skills such as orienteering, fire building, and star and constellation identification, may be taught and tested. Seek sufficient adult co-workers to accompany the class and expedite an overnight trek into natural surroundings. **(Organizational effectiveness; responsibility; self-esteem; teamwork; knowing how to learn; acquiring and applying what has been learned to specific task)**

Evaluation

- Discuss with students the use of the Unit Evaluation Form. Explain the rating scale that will be used for student evaluation.

- Copy written test and give to students as pretest. Record pretest score on the Unit Evaluation Form.

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."

- Evaluate job sheet. See the evaluation criteria listed at the top of the job sheet.

Suggested Activities

- Give and evaluate written test.
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form. Include any additional assignments.
- Measure competency gains by comparing written pretest scores with posttest scores.
- Meet individually with students to evaluate their progress through this unit of instruction, and indicate to them possible areas of improvement.
- Reteach and retest as required.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in the student edition. Then observe the student performing the procedure.

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Suggested Activities

Suggested Resources

Resources Used in Developing This Unit

- Jensen, Clayne R. *Outdoor Recreation in America.* Minneapolis: Burgess Publishing Co.
- Motz, Lloyd and Carol Nathanson. *The Constellations, An Enthusiast's Guide to the Night Sky.* New York: Doubleday, 1988.
- *Outdoor Kansas*, Vol. 1, #5. Wichita, KS 67201, 1995.
- *Report and Recommendations to the President of the United States*—President's Commission on American Outdoors. Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, December, 1986.
- Smith, Clodus R. *Rural Recreation for Profit.* The Interstate Printers and Publishers, Inc.
- U.S. Department of Interior, National Park Service. *Management Policies.* Washington, D.C.: U.S. Government Printing Office, 1989.
- U.S. Department of Interior, National Park Service. *Interpretation for Disabled Visitors in the National Park System.* Washington, D.C.: U.S. Government Printing Office.
- Wilcox, A. T. *Design for Maintenance.* U.S. Department of Interior, National Park Service. Washington, D.C.: U.S. Government Printing Office.
- *Working Papers.* The President's Commission on American Outdoors. Washington, D.C.: U.S. Government Printing Office, 1987.

Supplemental Resources

Print media

- Guides and maps of the national park system are available from:

  National Park Service
  P.O. Box 37127
  Washington, D.C. 20013-7127

Nonprint media

- Filmstrips
  - *Yosemite National Park*, 68-frame filmstrip and cassette or 14-minute video

Suggested Activities

— *Lassen Volcanic National Park*, 72-frame filmstrip and cassette or 13-minute video

Filmstrips are available from:

International Film Bureau Inc.
332 South Michigan Avenue
Chicago, IL 60604-4382
(312) 427-4545

- *Let No Man Regret*. 11 min. 16mm film or ½" VHS videotape. Discusses personal responsibility to preserve the natural beauty of our recreational areas. This is available from:

  Alfred Higgins Productions, Inc.
  9100 Sunset Boulevard
  Los Angeles, CA 90069-9990
  (213) 272-6500

- *A Question of Quality*, 010668/PY. 29 min. 16mm or ½", ¾", or Beta videotape. Developed by U.S. Department of Interior, National Park Service. Deals with protecting forests and wildernesses while still allowing visitors to enjoy them.

- *New Life for Ruined Land*, A08996/PY. 14 min. 16mm or ½", ¾", or Beta videotape. Developed by U.S. Department of Energy. Describes Department of Energy's Land Reclamation Program to convert an abandoned coal mining site in Southern Illinois into a wildlife refuge and recreational facility.

  U.S. Department videotapes are available from:

  National Audiovisual Center
  National Archives and Records Administration
  Customer Services Section PY
  8700 Edgeworth Drive
  Capitol Heights, MD 20743-3701
  (301) 763-1896

Outdoor Recreation
Unit 10

Answers to Assignment Sheets

Assignment Sheet 1—Identify Outdoor Recreation Activities and Facilities Available Locally

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 2—Make a Presentation About an Outdoor Recreation Activity

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 3—Interpret Graphs on Future Trends in Outdoor Recreation

1. 260,000,000
2. 270,000,000
3. 20,000,000
4. 18,000,000
5. 63.5
6. 6
7. 14
8. 3.7
9. Canoeing
10. 514.4

Assignment Sheet 4—Evaluate a Local Outdoor Recreation Site

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 5—Plan and Design a New Outdoor Recreation Area

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 6—Research Local Employment Opportunities in Outdoor Recreation

Student performance should be evaluated according to the criteria listed on the assignment sheet.

Outdoor Recreation
Unit 10

Answers to Written Test

1. a. 8 e. 9 h. 16
b. 5 f. 15 i. 1
c. 10 g. 6 j. 7
d. 13

2. Any four of the following:

Activity	Equipment	Facility
Archery	Bows, arrows, proper clothing	Archery range, public or private hunting area
Biking	Bicycle, helmet	Bike trails, safety signs
Bird watching	Binoculars, camera, bird books	Natural habitats for birds
Boating	Motor or sail boat	Lake or large river
Camping	Tent or trailer, cookware, lights, proper clothing	Table, grill, trash disposal, clean, scenic uncrowded area
Canoeing	Canoe, life jacket, paddles	Stream or lake
Fishing	Fishing pole, reel, bait	Lake, stream, or farm pond
Four-wheeling, ATV	Four-wheel-drive vehicle or other all-terrain vehicle	Rough or challenging terrain, dry stream beds
Golfing	Golf equipment	Golf course, driving range, or miniature golf course
Hang gliding	Hang glider	Steep terrain, dependable air currents
Hiking	Shoes, pack, food, maps	Hiking trails, scenic area
Horseback riding	Horse, riding gear (tack)	Barns, corrals, riding area
Hunting	Gun, ammunition, proper clothing	Private hunting area with permission or public hunting area
Jogging/walking	Proper shoes and clothing	Trails or tracks
Lawn games such as volleyball, badminton	Game equipment	Small open, uncrowded areas
Picnicking	Food, table	Shaded, scenic area, clean, free of pests
Rock/mountain climbing	Proper clothes, climbing equipment	Public/private climbing area
Scuba diving	Diving equipment, boat	Clear lake, ocean, or stream
Sight-seeing	Private vehicle or bus	Scenic turn-outs, information signs
Snow skiing	Skies, boots, proper clothing	Mountainous area, heavy snowfall
Surfing	Surfboard or sailboard	Coastal areas or lakes
Swimming	Life vest, "buddy"	Indoor or outdoor swimming area
Tennis	Tennis racquet, balls, shoes	Tennis court
Water skiing	Skies, boat, ski rope, life vest	Lake or large river

Answers to Written Test

3. a. Knowledge of the outdoors, safety
   b. Swimming technique, safety
   c. Saddling, caring for a horse, safety
   d. Biking technique, safety
   e. Yes
   f. No
   g. Yes
   h. Yes
   i. No

4. a, b, e

5. c

6. Any five of the following:

   a. Natural beauty
   b. Amount of crowding
   c. Sanitation facilities
   d. Parking availability
   e. Available information
   f. Picnic areas
   g. Cultural events
   h. User fees
   i. Concessions
   j. Organized sports
   k. Guided activities

7. Any three of the following:

   a. Fitness
   b. Social
   c. Excitement
   d. Experience self and nature
   e. Conformist

8. a, b, d, e, f

9. Any five of the following:

   a. Business management
   b. Entertainment
   c. Enforcement
   d. Equipment operation
   e. Ground care
   f. Guide service
   g. Instruction
   h. Recreation manager
   i. Rental
   j. Safety
   k. Sanitation

Answers to Written Test

10. Any six of the following:

    a. Contractual such as grounds care, landscaping, or sanitation
    b. Bait shop
    c. Dude ranch
    d. Equipment maintenance
    e. Equipment sales
    f. Fish farms
    g. Guide service such as for hunting, fishing, hiking, etc.
    h. Hunting preserve
    i. Instruction and sales
    j. Excursion boat
    k. R.V. campground
    l. Equipment rental
    m. Sporting good store
    n. Travel agent
    o. Youth camp

Outdoor Recreation
Unit 10

Written Test

Name ______________________ Date ______________ Score ____________

1. Match terms related to outdoor recreation with their definitions. Write the corresponding numbers on the blanks provided.

_____a. Activity that refreshes or restores a person's strength and spirit after work

_____b. A structure or convenience which allows something to be done more easily or enjoyably

_____c. View or landscape having natural beauty

_____d. Tract of ground, especially in regard to its features or fitness for some use

_____e. Free from work or activity

_____f. The general tendency of a course of events

_____g. Unoccupied time during which one may indulge in rest or recreation

_____h. One of a kind or distinctive

_____i. The right to sell food, supplies, or equipment at a park or event

_____j. An inner drive (need or desire) that causes one to act in a certain way

1. Concessions
2. Convenience
3. Cultural events
4. Demand
5. Facility
6. Leisure
7. Motivation
8. Recreation
9. Rest
10. Scenic
11. Statistics
12. Stress
13. Terrain
14. Tourism
15. Trend
16. Unique

2. List four outdoor recreation activities and the equipment and facilities needed for each.

Activity	Equipment	Facility
a. ____________	____________	____________
b. ____________	____________	____________
c. ____________	____________	____________
d. ____________	____________	____________

Written Test

3. State the skills and licenses needed for the following outdoor recreation activities.

Activity	What special skills are needed?
a. Hunting	
b. Swimming	
c. Horseback riding	
d. Biking	
Activity	Is license or permit needed?
e. Fishing	
f. Surfing	
g. Boating	
h. Hunting	
i. Jogging	

4. Select from the following list the major factors increasing the demand and participation in outdoor recreation. Place an "X" in the blanks next to the correct factors.

_______a. More leisure time increases participation.

_______b. More income increases participation.

_______c. Larger families increases participation.

_______d. Large workloads (more work) increases participation.

_______e. Greater mobility (easier travel) increases participation.

5. Select true statements concerning other factors affecting current and future participation in recreational activities. Place an "X" int he blank next to the true statement.

_______a. More Americans are retiring at a later age (over 70) which increases leisure time for outdoor recreation.

_______b. As more women join the work force and advance toward economic equity, they will have less leisure time.

_______c. As accommodations for the physically challenged improve, their participation in outdoor recreation will increase.

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Written Test

6. List five considerations when selecting an outdoor recreation area.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

7. List three reasons why people participate in outdoor recreation.

a. ______________________________

b. ______________________________

c. ______________________________

8. Select from the following list agencies responsible for public lands, recreation areas, and employment in outdoor recreation. Place an "X" in the blanks next to the correct agencies.

______a. U.S. National Park Service

______b. U.S. Forest Service

______c. U.S. Department of Energy

______d. State park services

______e. Regional, county, and city parks

______f. Private recreational businesses

9. List five employment opportunities in outdoor recreation.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

Written Test

10. List six business opportunities in outdoor recreation.

    a. ______________________________

    b. ______________________________

    c. ______________________________

    d. ______________________________

    e. ______________________________

    f. ______________________________

    g. ______________________________

    h. ______________________________

***Permission to duplicate this test is granted.**

Outdoor Recreation
Unit 10

Unit Evaluation Form

Student Name ______________________ Unit Rating __________

Assignment Sheet Ratings

Assignment Sheet 1—Identify Outdoor Recreation Activities and Facilities Available Locally Rating ______

Comments: ______________________

____

Assignment Sheet 2—Make a Presentation About an Outdoor Recreation Activity Rating ______

Comments: ______________________

____

Assignment Sheet 3—Interpret Graphs on Trends in Outdoor Recreation Rating ______

Comments: ______________________

____

Assignment Sheet 4—Evaluate a Local Outdoor Recreation Site Rating ______

Comments: ______________________

____

Assignment Sheet 5—Plan and Design a New Outdoor Recreation Area Rating ______

Comments: ______________________

____

Assignment Sheet 6—Research Local Employment Opportunities in Outdoor Recreation Rating ______

Comments: ______________________

____

Unit Evaluation Form

Advanced Applications (Optional)

Assignment Sheet Ratings

Assignment Sheet 1A—Develop a Historical Presentation for Visitors to Your Area Rating ______

Comments: ____

____

Assignment Sheet 2A—Evaluate Conflict Resolution Scenarios Rating ______

Comments: ____

____

Assignment Sheet 3A—Give Accurate, Easy-to-Follow Directions Rating ______

Comments: ____

____

Assignment Sheet 4A—Locate Constellations in the Night Sky Rating ______

Comments: ____

____

Assignment Sheet 5A—Analyze Current Reports Concerning the Growth of Outdoor Recreation and its Effects on the Environment Rating ______

Comments: ____

____

Job Sheet Ratings

Job Sheet 1A—Build a Wood-Conserving Dakota Fire Hole Rating ______

Comments: ____

____

Unit Evaluation Form

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ______________________________ Date ______________

Student Signature ______________________________ Date ______________

***Permission to duplicate this form is granted.**

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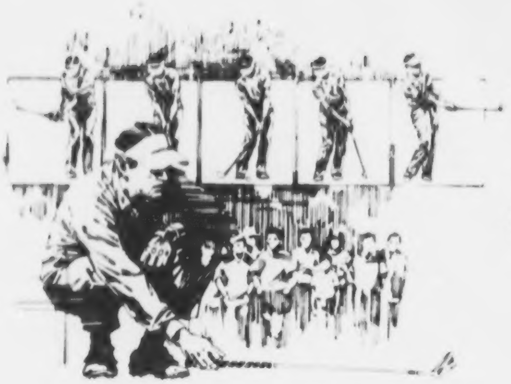
Why Do People Enjoy These Activities?



Golfing

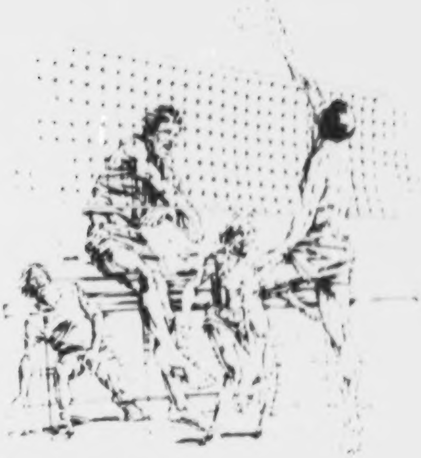
Jogging/Walking

Tennis

Biking

Why Do People Enjoy These Activities?

(Continued)



Volleyball

Skiing

Horseback Riding

Why Do People Enjoy These Activities?

(Continued)

Picnicking

Fishing

Hunting

TM 3

Career Opportunities in Outdoor Recreation

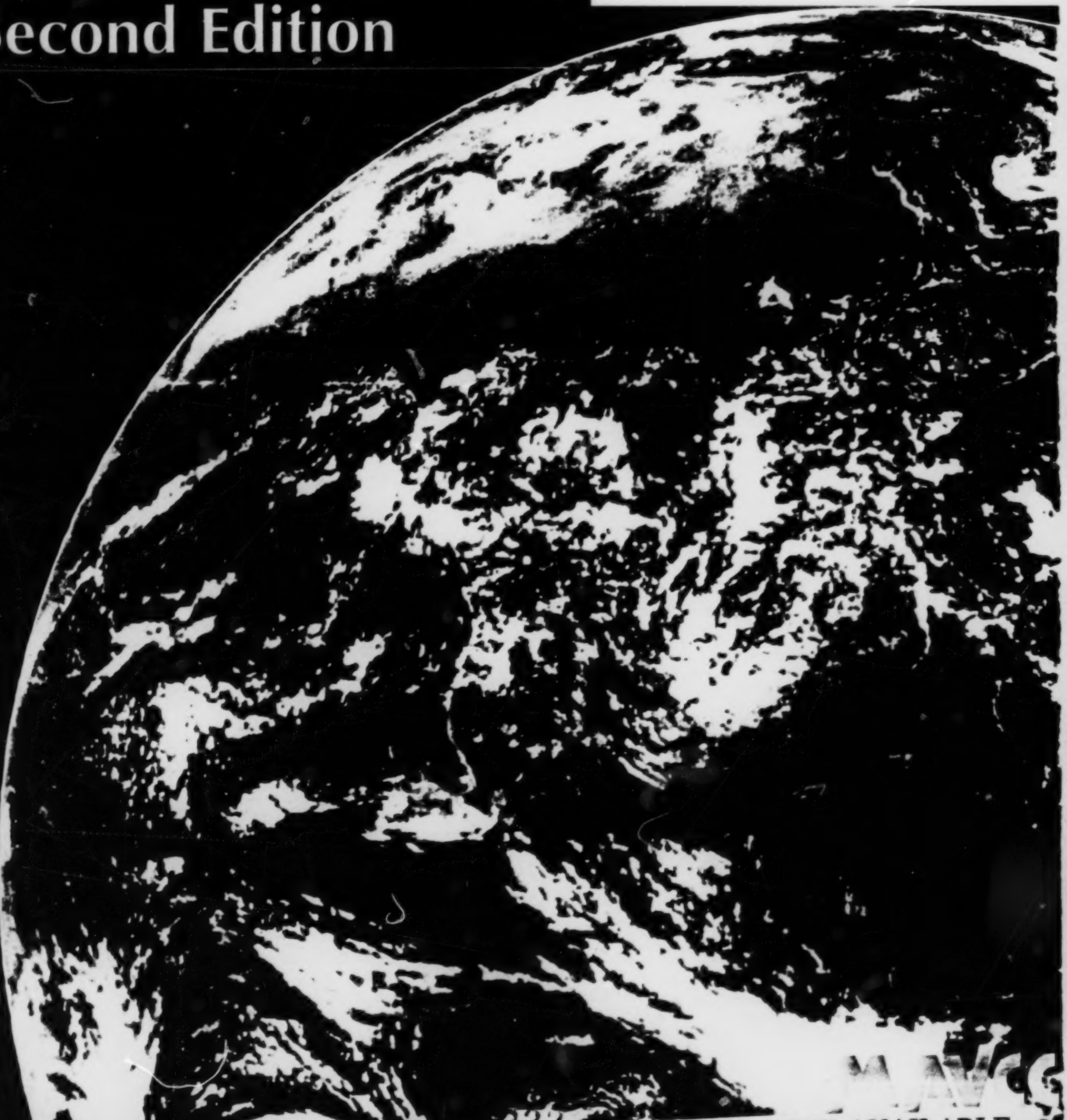
	Business Management	Entertainment	Enforcement	Equipment Operation	Ground Care	Guide Service or Inst.	Recreation Management	Rental	Safety	Sanitation
Archery	X			X	X	X	X	X	X	
Biking	X			X	X			X	X	
Boating	X	X	X	X		X	X	X	X	X
Camping	X	X	X	X	X	X	X	X	X	X
Canoeing	X	X	X	X		X	X	X	X	
City Parks	X	X	X		X		X		X	X
Fishing	X		X	X		X		X	X	
Four-Wheeling	X		X	X	X			X	X	
Golfing	X				X	X	X	X	X	
Hang Gliding	X		X	X		X	X		X	
Hiking					X	X		X	X	
Horseback Riding	X				X	X	X	X	X	
Hunting	X		X	X		X			X	
Jogging/Walking						X			X	
Lawn Games					X			X	X	
Picnicking		X			X				X	X
Rock/Mountain Climbing	X		X	X	X	X	X	X	X	
Scuba Diving	X		X	X		X	X	X	X	
Sight-Seeing	X	X			X	X	X		X	
Snow Skiing	X		X	X	X	X	X	X	X	
Surfing	X			X		X		X	X	
Swimming	X				X	X	X		X	X
Tennis	X			X	X	X			X	
Tourism	X				X	X	X	X	X	X
Water Skiing	X		X	X	X	X	X	X	X	

TM 4

INTRODUCTION TO

Natural Resources

Second Edition



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Introduction to Natural Resources

Second Edition

Student Edition

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Introduction to Natural Resources

Student Edition

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Outdoor Safety and First Aid
Unit 1

Objective Sheet

Unit Objective

After completing this unit, the student should be able to apply basic safety and first-aid skills that may be needed for outdoor-related situations. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 100 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to outdoor safety and first aid with their definitions.
2. Select true statements concerning basic first-aid procedures for emergency situations.
3. List ten items that should be found in a basic first-aid kit.
4. Describe the two types of poisonous snakes found in the United States.
5. Distinguish among types of poisonous plants found in the United States.
6. Distinguish between the two types of poisonous spiders found in the United States.
7. List two safety precautions to take for each type of inclement weather.
8. Explain how the components of the fire triangle work.
9. Match classes of fires with their definitions.
10. Match types of fire extinguishers with the classes of fires for which they were designed.
11. Complete statements concerning purposes of a material safety data sheet.
12. Complete statements concerning guidelines for lifting and carrying items safely.
13. Analyze scenarios to determine appropriate safety and first-aid procedures. (Assignment Sheet 1)
14. Interpret portable fire-extinguisher symbols. (Assignment Sheet 2)
15. Read wind chill index and water survival charts. (Assignment Sheet 3)
16. Demonstrate the Heimlich maneuver for an adult choking victim. (Job Sheet 1)

Objective Sheet

17. Operate a fire extinguisher. (Job Sheet 2)

18. Lift a heavy object properly. (Job Sheet 3)

Advanced Applications (Optional)

1. Interpret material safety data sheets. (Assignment Sheet 1A)

2. Analyze current reports concerning outdoor safety and first aid. (Assignment Sheet 2A)

Outdoor Safety and First Aid
Unit 1

Information Sheet

1. **Terms and definitions**

   a. **Accident**—Any suddenly occurring, unintentional event that causes injury or property damage

   b. **Anesthetic**—A substance that causes loss of the sense of pain or itching

   c. **Antiseptic**—A substance that prevents infection by killing bacteria

   d. **Cardiac arrest**—Stoppage of the involuntary beating of the heart

   e. **Cardiopulmonary resuscitation (CPR)**—Procedure for restoring normal breathing after cardiac arrest

   f. **Carelessness**—Failure to think before one acts; failure to pay attention

   g. **First aid**—Immediate temporary care given the victim of an accident or sudden illness or trauma until the services of a physician can be obtained

   h. **First-degree burn**—Burn affecting only the outer skin layers; characterized by redness and pain

   Example: A light sunburn

   i. **Frostbite**—Tissue damage due to freezing of tissue fluids

   j. **Grounded**—Electrical connection to an object that conducts electrical current to the earth

   k. **Habitat**—The region where a plant or animal naturally grows or lives

   l. **Hazard**—Potential source of danger

   m. **Hazardous material**—Any cancer-causing, corrosive, toxic, irritant, oxidizer, or other material that has the potential to damage specific body organs

   n. **Heat cramps**—Muscular pains and spasms due to loss of salt through sweating

   o. **Heat exhaustion**—Fatigue, weakness, and sometimes collapse due to loss of body fluids through sweating and lack of adequate water intake

   p. **Heat stroke**—Immediate, life-threatening emergency in which the victim has extremely high body temperature and a failure of the sweating mechanism

Information Sheet

q. **Heimlich maneuver**—Procedure for forcing a foreign object from the windpipe of a choking victim

r. **Hypothermia**—Below normal body temperature usually due to overexposure to low temperatures

Note: "Hypo" means low or under. "Hyper" means high or over.

s. **Material safety data sheet (MSDS)**—Form that lists and explains each of the hazardous materials that an employee works with so the employee can safely use the material and respond to emergency situations

Note: Federal law requires MSDSs be available to employees and that employees will be taught to read and understand them.

t. **Safety**—State or condition of being safe; freedom from danger, risk, or injury

u. **Second-degree burn**—Burn penetrating beneath the superficial skin layers; characterized by swelling and blisters

Example: A severe sunburn

v. **Shock**—A medical condition in which the operation of the circulatory system is partially or completely impaired by the body's reaction to injury or psychic disturbance

Note: Although exposure to electrical current (commonly known as a "shock") can cause symptoms of shock, the term shock is a medical term applied to the impairment of the circulatory system and is common to victims of traumatic injuries of many kinds.

w. **Third-degree burn**—Burn that destroys all skin layers and underlying tissue; characterized by charring or white, leathery appearance of the skin and lack of pain

Note: Third-degree burns are not painful because nerve tissue has been destroyed. Third-degree burns are the most severe and many times are life threatening, requiring lengthy treatment and skin grafts.

x. **Topical**—On the skin

Information Sheet

2. Basic first-aid procedures for emergency situations

Caution: Given the increased awareness of diseases carried by bloodborne pathogens, hepatitis B, Human Immunodeficiency Virus (HIV), and others, the U.S. Department of Labor in its brochure, *Occupational Exposure to Bloodborne Pathogens*, states that universal precautions be observed any time blood or other human body fluid is present. This precaution requires employers and employees to assume that all human blood and specified human body fluids are infectious for HIV, HBV, and other bloodborne pathogens. Where it is impossible to determine the type of body fluid present, all body fluids are to be considered as potentially infectious.

a. Bleeding

- Minor bleeding—Apply antiseptic solution or cream and dress wound with sterile bandages.
- Severe bleeding—Elevate the wound and apply dressing or manual pressure to the wound.

b. Burns

- Chemical—Flush skin thoroughly with clean water and seek medical attention.
- Electrical—Locate both entrance and exit burns; cool with a damp compress, then cover with a dry, sterile dressing; and cover victim with a blanket and elevate feet and legs to prevent shock and loss of body heat.
- First-degree—Hold under cold water, then apply dry, sterile dressing.
- Second-degree—Cool with a damp compress, taking care not to break the blisters, then cover with a dry, sterile dressing to prevent infection.
- Third-degree—Cool with a damp compress and then cover with a dry, sterile dressing; cover the victim with a blanket, elevate feet and legs to prevent shock and loss of body heat.

Information Sheet

c. **Traumatic shock**

Note: Traumatic shock may occur within any time period following an injury. Although the injury itself may not be life threatening, the onset of shock resulting from the injury can be fatal.

- Recognize signs and symptoms of traumatic shock.

✔	**Early stages**
___	Pale or bluish skin that is cool to touch
___	Moist, clammy skin if perspiration has occurred
___	General weakness
___	Rapid, weak pulse
___	Rapid, shallow, possibly irregular breathing
___	Restlessness or anxiety
___	Vomiting or nausea
___	Excessive thirst
✔	**Late stages**
___	An attitude of not caring
___	Unresponsiveness
___	Sunken eyes with dilated pupils
___	Spotty or mottled appearance of skin; bluish color to lips and nailbeds
___	Low body temperature; cool, clammy skin
___	Loss of consciousness leading to death if untreated

- Lay victim down.
- Elevate victim's legs slightly.
- Cover to prevent loss of body heat.

Note: In some cases it may be necessary to have someone lie in close contact with victim to conserve body heat.

d. **Falls**

- Head injury—Lay victim flat, then control bleeding and shock.
- Less severe falls—Check for injury and provide first aid as appropriate; and do not move victim or allow victim to move if a neck or back injury is suspected.

Caution: If either neck or back is broken, moving the victim could sever or damage the spinal cord causing immediate death or paralysis.

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e. Choking

- Recognize signs and symptoms of choking:
  - Victim clutches throat (universal sign of choking)
  - Victim has trouble speaking or breathing
  - Skin turns pale or bluish
  - Victim loses consciousness
- Perform the Heimlich maneuver.

f. Electrical accident

Caution: If the victim is still in contact with a live electrical circuit, do not endanger yourself by touching the victim, or metal objects, water, or wet ground. You may well become a victim yourself as the current passes through your body. Death can be instantaneous.

- Do **NOT** provide any assistance until all electrical current has been shut off.
- Administer CPR if necessary.
- Treat for traumatic shock.
- Treat for electrical burn.

Note: Always look for both an entrance and an exit wound with an electrical burn. Both may resemble a bull's-eye consisting of a central charred zone, a middle zone of gray tissue, and an outer red zone.

g. Heat exhaustion

- Recognize the signs and symptoms of heat exhaustion:
  - Profuse perspiration
  - Pale, clammy skin
  - Rapid, weak pulse
  - Rapid, shallow breathing
- Immediately move victim to a cool place.
- Lay victim flat.
- Elevate victim's feet slightly.
- Remove as much of the victim's clothing as possible.
- Sponge victim with cool water.

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h. **Heat stroke**

Note: Heat stroke is a true emergency. Act quickly or the victim will suffer brain damage or death.

- Recognize the signs and symptoms of heat stroke:
  - Little or no perspiration
  - Hot, flushed skin
  - Rapid, weak pulse
  - Rapid, shallow breathing
- Move victim immediately to a cool location.
- Cool victim as quickly as possible.

  Note: Do not take time to remove a victim's clothing until after initial cooling, such as spraying the victim with a garden hose, the contents of an ice chest or drinking water container, or immersing in a nearby stream or pond.
- Rub ice on victim's extremities.

i. **Mild hypothermia**

- Recognize the signs and symptoms of **mild** hypothermia:
  - Shivering
  - Complaints of cold
  - Loss of coordination
  - Psychological withdrawal and apathy
- Get the victim out of cold, wet conditions.
- Replace wet clothing with dry clothing, or add insulation.
- Place victim in warm environment.
- Offer warm liquids or food only if victim is fully conscious.

j. **Moderate hypothermia**

- Recognize the signs and symptoms of **moderate** hypothermia:
  - Listlessness, mental confusion, refusal to recognize problem
  - Uncontrollable shivering
  - Slurred speech
  - Stumbling
- Cover victim at the site rather than walking to shelter.

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- Treat victim gently and avoid unnecessary jostling or movement.

- Do not allow victim to exercise or move.

- Check victim for other injury, including frostbite.

k. **Severe hypothermia**

- Recognize the signs and symptoms of **severe** hypothermia:

  - Unresponsiveness
  - Decreased pulse and respiration
  - Cessation of shivering
  - Physical collapse

- Treatment should be attempted only if victim cannot be evacuated for professional emergency care.

- Deliver warmth to head, neck, armpit, and groin areas by application of warm water bottles, warmed blankets, or another warm body.

l. **Animal bite**

Note: First aid for animal bites is similar to any other wound, except for the need to be aware of the possibility of rabies infection.

- Cleanse wound thoroughly with soap and water; apply antiseptic.

- Cover bite wound with a sterile dressing and bandage.

- Seek medical attention, especially if the bite is on the face, head, or neck areas.

m. **Insect stings**

Note: In case of a bee sting, the insect's stinger likely will still be imbedded in victim's skin. Scrape stinger sideways to remove. Never pinch the stinger to remove as this actually will inject more toxin into the wound.

- Ordinary reaction—Wash wound with soap and water and apply ice to reduce swelling

- Allergic reaction

  Note: A victim with an allergic reaction to a bee sting is suffering from anaphylactic (respiratory arrest) shock and needs prompt treatment with epinephrine by injection or inhalation.

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- If possible, immediately evacuate the victim to a hospital or physician's office.

  Note: Have someone call ahead to notify the party of the situation and your planned arrival.

- If transportation is not immediately available, lay the victim down or help the victim to a position in which he or she can breathe more easily.
- Elevate the victim's legs if possible.
- While waiting for emergency aid, remove the stinger and perform first-aid actions for an ordinary sting.

n. **Snake bite**

- Nonpoisonous

  - Cleanse wound with plain water and soap.
  - Cover with sterile dressing.
  - Seek medical attention.

- Poisonous—Pit viper

  Note: Within the medical community there is a vigorous controversy over the advisability of using antivenin injections in the treatment of snake bites originating from copperheads, rattlesnakes, and cottonmouth (water moccasin). Although in the case of the coral snake, antivenin treatment is recommended, because of the conflicting opinions on the use of similar materials for pit viper bites, professional medical assistance is advisable and decisions on the use of antivenin should be left up to those professional individuals.

  - Immobilize the victim.
  - Have him or her lie down, and keep quiet.
  - Do not give victim liquor.
  - Apply a constricting band about the affected appendage just above the fang marks as soon as possible.

    Note: Under no circumstances should the constricting band be tight enough to block venous or arterial blood flow. Also, as edema (tissue swelling due to concentrations of water and waste material) builds, the band should be moved further from the wound periodically.

  - Apply suction as quickly as possible to wounds to remove venom.

    Note: Suction cups, "Extractor" devices, and mouth suction (be aware of cautions on bloodborne pathogens) are recommended to remove as much venom as possible. Suction should be continued up to four hours after the bite, although the amount of venom removed by this method will be sharply reduced after the first 15 minutes. Still, as pit viper venom degenerates tissue and blood cells near the wound, suction removal of this waste material will be helpful in preventing the victim's body from having to filter this material through the lymphatic and renal systems.

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- — Apply hot and cold compresses, alternated every three to five minutes.

  Note: Raising the temperature of venom tends to break it down, and lowering temperatures tend to cause the capillary system to contract. The continual differing stimuli help provide fresh oxygenated blood flow to the wound area and tend to prevent additional tissue damage.

- — Seek medical attention at once.

- Poisonous—Coral snake

  Note: The venom of the coral snake is similar to that of the cobra in that it attacks the nervous system, unlike venom of pit vipers which attacks the blood and circulatory system. Because of this, immediate medical attention and administration of antivenin is necessary. Death can come rapidly.

  - — Immobilize the victim. Have him or her lie down and keep quiet.
  - — Apply arterial tourniquet (tight enough to stop blood flow) up to 30 minutes.
  - — Seek medical attention at once for antivenin administration.

o. **Tick bites**

- Carefully remove an imbedded tick with tweezers by grabbing the tick as close to the skin as possible and pulling gently straight out.

  Note: Removing the tick with the thumb and forefinger carries the risk of crushing the tick and actually injecting the victim with the juices of the tick.

- Wash area with soap and water.

- Use a topical antiseptic and be alert for signs of tick-borne diseases for several weeks.

  Note: Some ticks are carriers of Lyme disease and Rocky Mountain Spotted Fever.

p. **Spider bites**

- Apply cold water or ice; a topical antiseptic may be used; take aspirin or acetaminophen for pain; and rest.

  Note: The bite of either the black widow or brown recluse spider is highly toxic and dangerous. If bitten by either of these species (or if you are not certain of the biting spider's identification) seek medical attention at once.

3. **Contents of a basic first-aid kit**

a. Antiseptic to kill bacteria

b. Adhesive bandages

c. Gauze pads, various sizes

d. Gauze roller bandages

e. Triangular bandages for large wounds and slings

f. Scissors

g. Tweezers

h. Elastic bandages for sprains

i. Pain relievers

j. Snake bite kit

4. Types of poisonous snakes

Note: The poisonous snakes of the U.S. include members of two families, *Elapidae*, represented by the coral snakes; and *Viperidae* (subfamily *Crotalidae*), represented by the copperhead, cottonmouth (water moccasin), and rattlesnakes.

a. Coral snake

- Small snake with colorfully-banded markings of red, yellow, and black rings with red and yellow rings touching

  Note: Any snake in the eastern half of the U.S. with red and yellow rings touching is venomous. An old saying goes, "Red and yellow can kill a fellow. Red and black, a friend of Jack."

R	Y	R	Y	B	Y	R	Venomous

R	B	Y	B	R	B	Y	Nonvenomous

- Tubular fangs that inject a highly toxic venom which attacks the victim's nervous system

- A double row of plates beneath the tail

- Round pupils

- A black nose

- Range is eastern one-third of Texas, southern Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, and northward across the coastal plain to southern North Carolina

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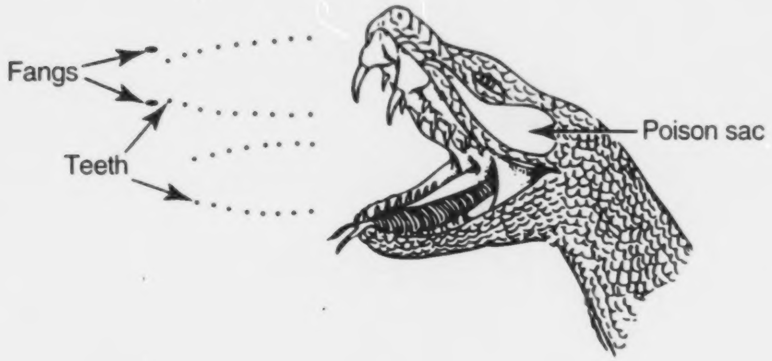
b. Pit vipers

- Usually two well-developed fangs capable of injecting venom which affects the circulatory system and blood

  Note: While the bite of the copperhead is usually not fatal, the cottonmouth (water moccasin) and even small rattlesnakes are extremely dangerous.



- A pit between the eye and nostril on each side of face
- Vertically elliptical pupils
- Triangular-shaped head with a narrow neck
- One row of plates beneath the tail
- Range and color markings
  - Copperhead—Alternate light and dark brown saddle bands the full length of the body; found in the southeastern one-third of the U.S. from the Big Bend of Texas across the eastern two-thirds of Oklahoma, the eastern third of Kansas to extreme southeastern Nebraska and eastward to New York State
  - Cottonmouth—Dark brownish-black with indistinct bands (although many snakes are similarly marked); large scales over the eye preventing upward vision and facial pit are easily distinguished; found in the southeastern one-fourth of the U.S. in generally slow-moving and stagnant waters
  - Rattlesnake—Rattles, facial pits; markings differ among the more than 30 species and subspecies of rattlesnakes; found in isolated areas throughout the lower 48 states of the U.S.

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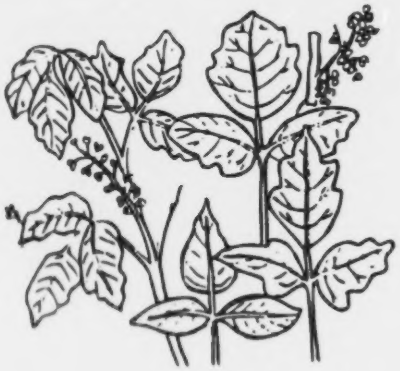
5. Types of poisonous plants

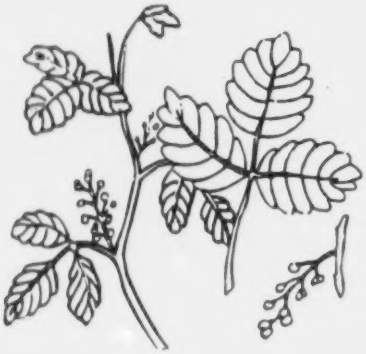
Note: The effects of poisonous plants can be headache, fever, itching, redness, and/or rash. Both poison ivy and poison oak are poisonous all year.

a. Common poison ivy (*Rhus radicans*)



- Grows as a small plant, a vine, and as a large shrub
- Has greenish white flowers, and whitish berries that grow in clusters
- Leaves always consist of three glossy leaflets
- Grows throughout the U.S. except in California and parts of adjacent states

b. Western poison oak (*Rhus diversiloba*)



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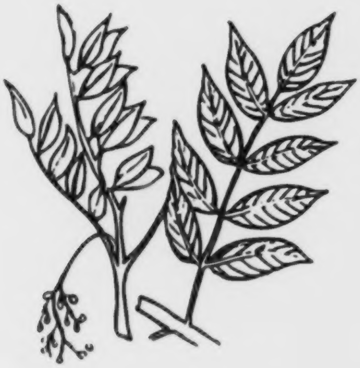
- Grows in shrub and sometimes vine form
- Leaves always consist of three leaflets
- Has greenish white flowers, and whitish berries that grow in clusters
- Grows in California and parts of adjacent states
- Sometimes called poison ivy, or yeara

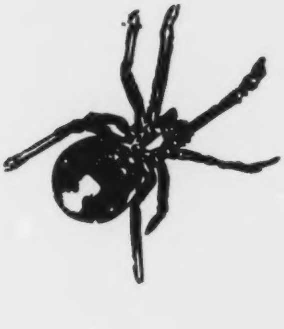
c. Poison sumac (*Rhus vernix*)



- Grows as a woody shrub or small tree from 5 to 25 feet tall
- Grows in most of the eastern third of the U.S.
- Also known as swamp sumac, poison elder, poison ash, poison dogwood, and thunderwood

6. Types of poisonous spiders

a. Black widow (*Latrodectus mactans*)



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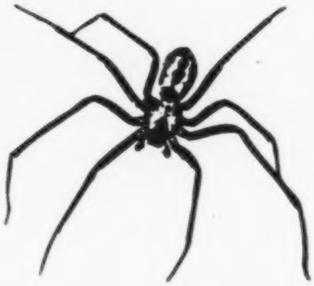
- Shiny black body with red to orange "hour glass" design on its abdomen
- Found in trash dumps, ash piles, under boxes, crates, stones and wood piles, and in outdoor toilet facilities
- Bite looks like a pin prick; severe pain caused by nerve toxins begins within minutes accompanied by sweating, cramps, nausea, and difficult speaking and breathing

b. Brown recluse (*Loxosceles reclusa*)



- Dark tan to dark brown body with lighter brown head; dark "fiddle or violin" design on back of thorax
- Found in buildings, closets, old clothes, on undersides of tables and chairs, and under rocks and bark
- Bite area swells painfully and grows hard; blisters or ulcers form and a rash may cover the body within 24-48 hours; accompanied by chills, vomiting, nausea, and fever; within one to two weeks the skin and muscle at the bite area slough off, leaving severe scars

7. Safety precautions to take in inclement weather

a. Lightning

- Take shelter in a vehicle with windows rolled up or in a building if possible.
- Avoid sheltering under trees.
- Avoid hilltops and open country during approach and duration of thunderstorms.

  Note: Take lightning seriously. More people are killed by lightning each year than by tornadoes and hurricanes. Lightning strikes can occur far in advance and to the rear of an active thunderstorm.

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b. Heavy rain

- Avoid low-lying areas, or obvious drainage areas when heavy thunderstorms are present (unless the direct approach of a tornado is imminent)

- Never drive into running water.

  Note: An average car or pickup truck can be floated and washed downstream in as little as 20 to 24 inches of water.

- Take lightning precautions.

c. Tornado

- Seek shelter in low areas.

- If no shelter is available, move at right angles to the approach of the funnel cloud.

- Do not seek shelter in an automobile or mobile home.

d. Winter storm

- Be alert to weather forecasts.

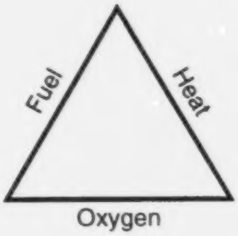
- Be prepared with food, water, and sheltering material such as blankets, tents, and candles.

- Be alert to signs of hypothermia if stranded in a winter storm.

- Take precautions to avoid carbon monoxide poisoning if stranded in a vehicle as snow may build up around exhaust system.

8. Components of the fire triangle

Note: The fire triangle represents the three elements that are necessary for fire. Combustion can occur only when the fire triangle is complete. A fire will stop burning if any part of the fire triangle is broken.



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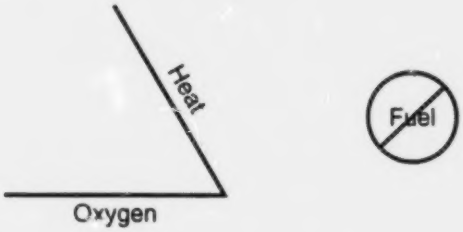
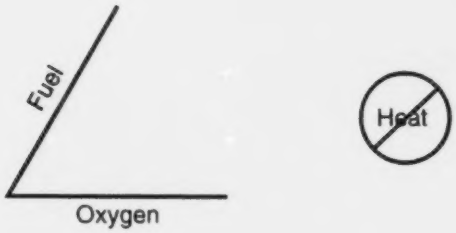
a. **Fuel** is anything that burns at the fire site. Examples are dried grass or leaves, small trees, large trees and limbs, brush stumps, gasoline, oil, and paper. The arrangement of the fuel will affect the amount of heat. The temperature must be high enough to ignite the fuel. The source of fuel must be eliminated to stop a fire.

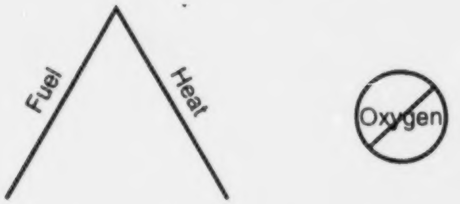


In the case of a grass or timber fire, clear the area, cut or plow a firebreak, and use another fire to rob the fire of fuel between it and the fire break.

b. **Heat** comes from the fire itself and, as long as there is plenty of fuel and oxygen, a fire will continue to burn, producing greater heat. The temperature must be high enough to ignite the fuel. Heavy fuels such as logs and timber burn hotter. When the heat is removed, the fire triangle is broken.



c. **Oxygen** must be available in the air and the more oxygen a fire has, the faster and hotter it will burn. Wind brings more oxygen to a fire. Remove the oxygen supply to break the fire triangle.



- For grass and timber fires, smother with dirt or sand, swat with wet burlap sacks, swatter tools, and/or shovel.
- In the case of gasoline or electrical fires, use the proper fire extinguisher.

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9. **Classes of fires and their definitions**

   a. **Class A**—Fires that occur in ordinary combustible materials such as wood, rags, paper, and rubbish

   b. **Class B**—Fires that occur with flammable liquids such as gasoline, oil, grease, paint, solvent, and thinners

   c. **Class C**—Fires that occur in or near electrical equipment such as motors, switchboards, and electrical wiring

   d. **Class D**—Fires that occur with combustible metals such as magnesium, phosphorus, or sodium

Caution: Never apply water to a flammable liquid or gas fire. Such action can cause the fire to spatter and spread.

10. **Types of fire extinguishers and classes of fires they were designed to extinguish**

    a. Pressurized water—Used on Class A fires

    b. Foam—Used on Class A and B fires

    c. Carbon dioxide (CO_2)—Used on Class B and C fires

    d. Dry chemical—Used on Class B, C, and D fires

11. **Purposes of a material safety data sheet (MSDS)**

    Note: The federal Occupational Safety and Hazard Act (OSHA), administered by the U.S. Department of Labor, requires employers to keep material safety data sheets (MSDS) on all hazardous substances used by employees. Working outdoors, employees may encounter fertilizers, pesticides, fuels and lubricants, and various other chemicals which may be covered under OSHA's MSDS regulations. Employees should be aware of their responsibilities and those of their employers concerning access to MSDS information and training.

    a. To inform the user of the material's physical properties or fast-acting health effects that make it dangerous to handle

    b. To tell the user the level of protective gear needed

    c. To tell the user the first-aid treatment necessary if exposed to the product or its hazards

    d. To tell the management and the user the preplanning needed for safely handling spills, fires, and day-to-day operations with the material

    e. To tell the user how to respond to accidents

Information Sheet

12. Guidelines for lifting and carrying items safely

a. Before lifting

- Inspect the item to be lifted for jagged edges, splinters, grease, or other slippery surfaces.
- Wear gloves for protection.
- Wear lower back support.

  Example: leather lower-back support belt
- Plan your route before you lift.
- Clear any obstacles from your path.
- Assess the weight of the load.
- Get help for heavy loads.

b. Lifting

- Place your feet as close to the load as possible, one foot alongside the load and the other behind it.
- Bend your knees, keeping your back and neck straight and your chin tucked in.
- Grasp the load firmly with your fingers and hands.
- Draw your arms in close to your body.
- Stand slowly and lift smoothly, *using your legs*.

c. Carrying

- Hold item close to your body.
- Do not allow load to block your vision.
- Do not change your grip or twist your body to change direction.

  Note: Twisting the back while carrying a load (even a small one) can result in severe back injury.

d. Setting the load down

- Bend your knees.
- Keep your back and neck straight and aligned.
- Place load carefully where you want it, taking care not to allow it to rest on your feet or fingers.

Outdoor Safety and First Aid
Unit 1

Student Supplement 1—A Systematic Look at First Aid

First aid can be defined as "immediate temporary care given the victim of an accident or sudden illness or trauma until the services of a physician can be obtained."

The goal of first aid is to intervene actively to prevent further damage, to provide life support, and to begin effective treatment of the victim's condition, to minimize injury and prevent death. Although first aid is not a substitute for medical care, those trained in first aid are able to assess the nature and extent of an emergency and determine the best course of action to take until professional medical help arrives.

Scene Survey

First aid begins with a scene survey. Before approaching a victim, a survey of the area is necessary to determine if conditions surrounding the incident may place the victim and the rescuer in danger.

Primary Survey

Next, the primary survey will determine if lifesaving procedures must be immediately performed to save the victim's life. The primary survey involves checking the ABCs:

A: Is the AIRWAY open and the victim's neck stabilized?

The severity of spinal cord injuries has decreased 30-45 percent since awareness that the neck of an accident victim must be stabilized (supported or immobilized) before moving the victim.

B: Is the patient BREATHING?

C: Is the victim's blood CIRCULATING? Is there a pulse? Or is there active bleeding?

Lifesaving procedures, including cardiopulmonary resuscitation (CPR), may be needed to provide basic life support when a victim has no pulse and is not breathing. The Heimlich maneuver aids choking victims by forcing ejection of obstructing material from the windpipe.

Secondary Survey

The secondary survey is a total body examination, a pulse check, respiration count (breaths per minute), and observation of skin conditions. For electrical shock victims, this would be the time to search for both entrance and exit wounds.

For severe medical problems, such as heart attack, stroke, or internal bleeding, the only outward sign of problems may be shock. Those in shock will have pale, cool, and clammy skin; a rapid and weak pulse (over 100 beats per minute); more than 20 breaths per minute; weakness; and confused behavior. Treatment involves minimizing body heat loss, elevating the legs without disturbing the rest of the body, and getting help as quickly as possible.

Outdoor Safety and First Aid
Unit 1

Student Supplement 2—Using the Heimlich Maneuver

A Choking Adult

Someone who is choking and cannot breathe has just four minutes before death or permanent brain damage takes place. Thousands of adults and children die from choking each year. Fortunately, in 1973, Dr. Henry Heimlich created a life-saving technique to help choking victims. The Heimlich maneuver is so simple to learn that an 8-year-old child was reported to have saved the life of his older brother by using this technique.

Recognize choking

Most often, adults begin choking while they are eating. Instinctively, people who are choking clutch at their throats. A person who is choking cannot talk to you, but if you ask someone who is clutching his or her throat "Are you choking?" in most cases the person can nod his or her head "yes." There are three other symptoms of choking. First, the person has trouble speaking or breathing. Second, the skin turns pale or bluish. Finally the victim loses consciousness.

A person who is choking may feel somewhat embarrassed and may try to leave the room. Obviously, this can be dangerous—if the person should black out with no one there, he or she could die in a matter of minutes. Never allow a choking victim to leave the room alone.

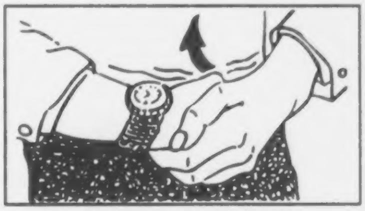
How to do the Heimlich maneuver

The Heimlich maneuver can be done in different ways, but it always depends on a quick upward thrust into the choking victim's abdomen. This movement forces air out of the lungs suddenly, which then forces the food or object out of the windpipe.

Most commonly, the victim is standing. If you are the rescuer, stand behind the victim and circle his or her waist with your arms. Make a fist (your thumb knuckle will stick up somewhat like a knob). Place the knob just above the person's navel. Hold your fist tightly with your other hand, and make quick, strong, upward thrusts into the victim's abdomen. Repeat the movement until the foreign object is dislodged and the person is able to breathe freely. (If the food or object does not fall out of the person's mouth, remove it carefully by hand to avoid re-inhaling.)

To avoid rib injuries, use only your hands when helping the victim. Do not squeeze with your arms in a "bear hug." If the victim is sitting, you can perform the maneuver the same as you would if he or she were standing. If the victim is lying on the floor, make sure he or she is rolled face up. Then, kneel with your legs on either side of the victim and perform the upward thrusts. (This approach works well for rescuers who are small or relatively weak.)

In the past 15 years, the Heimlich maneuver has saved thousands of lives. It takes only a few minutes to learn and may be the most valuable skill you will ever learn.



Make a fist with one hand, place the thumb against the abdomen, and make quick upward thrusts until the food or object is forced out of the windpipe.

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Student Supplement 2

A Choking Child

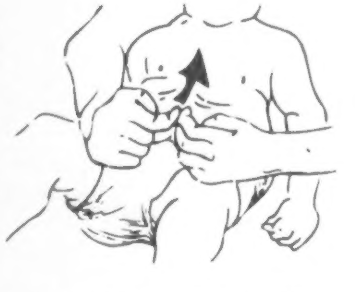
Small children are curious and often put things in their mouths. It is easy for a child to choke on a piece of food or a part of a toy. Often, coughing will force the object out of the child's throat, but sometimes, natural reactions are not enough. Within only four minutes after a child or adult stops breathing, death or permanent brain damage takes place.

Recognize a choking child

A choking child may grab her throat. She will probably look terrified. If she is an older child, ask "Are you choking?" Even if she can't speak, she may be able to nod her head "yes." If a child is unconscious and not breathing (and you see no signs of physical injury) she may be choking.

How to do the Heimlich maneuver

The Heimlich maneuver can be done in different ways, but it always depends on quick upward thrusts to the abdomen. This forces air out of the lungs suddenly, which then forces the food or object out of the windpipe. When a child is choking, never try to remove the object by hand, or slap the child on the back. This can actually force the item further into the throat and may waste valuable time.



When a young child is choking, use your fingers to push up firmly and quickly into the child's abdomen. This should force the object out of the windpipe.

When you do the Heimlich maneuver on an older child, use your fist to perform the thrust.

Infants and young children

Place the child on your lap with his or her back to you. Put your index and middle fingers on both hands on the child's abdomen, slightly above the navel. Make sure your hands are not touching the rib cage. Make quick, firm thrusts upward into the child's abdomen. You may need to make as many as six thrusts, or it may take just one or two. You'll know the maneuver has worked if the child is now crying or breathing easily and the skin loses its bluish color. The food or object often pops out of the victim's mouth, but if it has not done so, remove it carefully yourself. (The same procedure can be performed with the child lying on his or her back on the floor.)

Older children

When you do the Heimlich maneuver on an older child, use your fist instead of your fingers to perform the thrust. The child can be standing, sitting, or lying down. First make a fist (your thumb knuckle will stick up like a knob). Place the knob just above the child's navel. Hold your fist tight with your other hand, and make quick upward thrusts into the child's abdomen.

Prevent choking

Never let your child run or play while eating. Don't let small children play with marbles or toys that have parts small enough to swallow. Never feed nuts to small children. Choking is very common in children, but in many cases, it *can* be prevented.

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Outdoor Safety and First Aid
Unit 1

Student Supplement 3—Lifesaving Facts About Hypothermia

Hypothermia means lowered body temperature. It also can mean death to its victims if it is not prevented.

The danger of hypothermia comes from not knowing its symptoms or the conditions which can lead to its development. Ultimately, hypothermia saps the body's strength and energy. When the inner body becomes chilled sufficiently, the body can no longer generate enough heat to protect itself with a normal body temperature of around 98.6 degrees Fahrenheit. When this occurs—after violent shivering and mental stupor—the victim of hypothermia enters a state of tranquility, apathy, and uncontrollable sleepiness. Sleep brings a peaceful death. Many times, once hypothermia begins it is very difficult to reverse.

Hypothermia can start in wet conditions such as rain, snow, or sleet, but perspiration from exertion can start one on the way to hypothermia if wind conditions are right and sufficient clothing is not being worn. Even the humidity in the air can chill one enough to initiate hypothermia.

Most hypothermic deaths occur from accidentally falling into water during outdoor activities such as hunting, fishing, boating, or hiking. In the proper conditions, a boating accident which puts you in the water can take your life in much less than an hour—even if you are not injured.

Walking through the woods in wet conditions can soak clothing sufficiently that any wind can seriously lower body temperatures to the danger point. Any wind, even that generated by walking in cold, calm conditions, can cool the human body to dangerous levels. In short, if you become wet and chilled you are in danger.

Fatigue makes it harder for the body to generate heat, so people in poor physical condition or those who have been over exerting (such as those involved in boating accidents, those who have been running in a panic when they are lost, or those struggling to aid an injured companion) are the most likely candidates for hypothermic problems. Alcohol consumption also increases body heat loss because it increases the blood flow by dilating blood vessels.

The human body's automatic defense against the cold causes blood to flow from one's limbs to the inner organs and the brain to maintain consciousness and life. However, when this happens oxygen levels in the brain drop, causing impaired thinking. The victim begins to shiver and loses some control of arms and legs in the process. The shivering becomes severe and muscles begin to contract violently in spasms. Total loss of body control may follow. These conditions lead to falls and further problems.

To prevent hypothermia a person needs to know its causes and maintain the presence of mind to avoid careless mistakes and poor judgment calls.

- If you get wet, get out of the wind and weather. Change clothes, build a fire, and get warm.
- Avoid over-exertion which leads to perspiring and fatigue.
- Dress in layers so you can adjust the amount of clothing you wear to meet the conditions in which you find yourself. Wool is an excellent outdoor clothing material. Wool maintains its ability to hold heat next to the body even if it is soaked.

Student Supplement 3

- Carry protection from wind. A lined nylon windbreaker or light raincoat that allows your body to breathe while turning the rain will help prevent chills.
- Keep your head warm. Your face, neck, and head lose body heat faster than other parts of the body. Your sides and groin also lose heat quickly.
- In cold, wet conditions eat regularly and drink plenty of warm liquids. Do not consume alcohol in these conditions.

The following charts illustrate the dangers of prolonged exposure to cold water and to the dangers of frostbite in varying combinations of temperatures and wind.

Water Survival Chart

If the Water Temp. (°F) Is...	Exhaustion or Unconsciousness Occurs In...	Expected Time of Survival Is...
32.5	Under 15 Minutes	Under 15-45 Minutes
32.5-40.0	15-30 Minutes	30-90 Minutes
40-50	30-60 Minutes	1-3 Hours
50-60	1-2 Hours	1-6 Hours
60-70	2-7 Hours	2-40 Hours
70-80	3-12 Hours	3-Indefinitely
over 80	Indefinitely	

Wind Chill Index

Estimated Wind Speed in MPH	Actual Thermometer Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Temperature (°F)											
Calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−88
10	40	28	16	4	−9	−21	−38	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−36	−45	−58	−72	−88	−89	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−124
25	30	16	0	−15	−29	−44	−59	−74	−83	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−84	−107	−128	−140
35	27	11	−4	−20	−35	−49	−67	−82	−88	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER* (for properly clothed person)				INCREASING DANGER*			GREAT DANGER*				
	*DANGER FROM FREEZING OF EXPOSED FLESH											

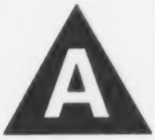
Outdoor Safety and First Aid
Unit 1

Student Supplement 4—Using Portable Fire Extinguishers

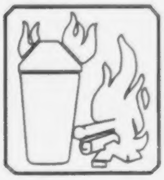
All portable fire extinguishers are labeled with picture and shape symbols. Each of the shape symbols (triangle, square, circle, and star) contains the letter of the fire class for which the extinguisher is effective. The picture symbols not only illustrate what type(s) of fire the extinguisher may be used on, but also tell what class(es) of fire the extinguisher should **not** be used on. All of this information, as well as directions for using the extinguisher, are also printed on the extinguisher. However, when a fire is discovered, speed is important, and, as the saying goes, "A picture is worth a thousand words." You should learn to be able to glance at the symbols on an extinguisher and know immediately whether the extinguisher is appropriate for the fire on hand.

Below are examples of fire-class shape symbols and their meanings, and examples of extinguisher picture symbols and their meanings.

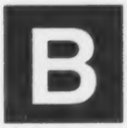
Class A



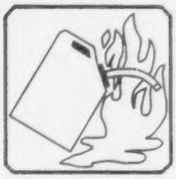
- Ordinary combustibles



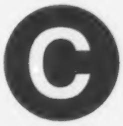
Class B



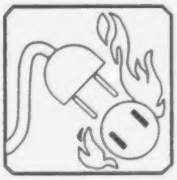
- Flammable liquids and gases



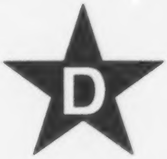
Class C



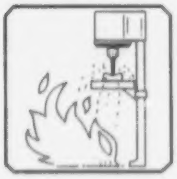
- Live electrical equipment



Class D



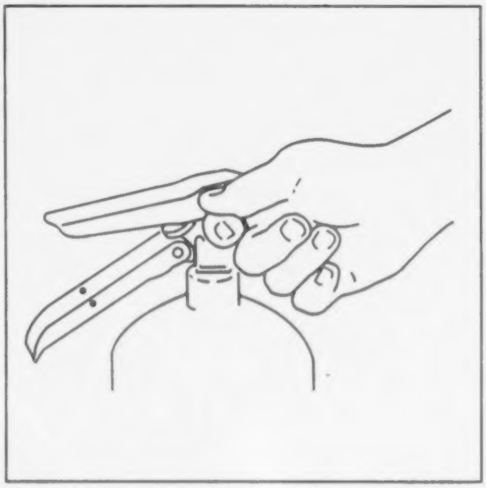
- Combustible metals



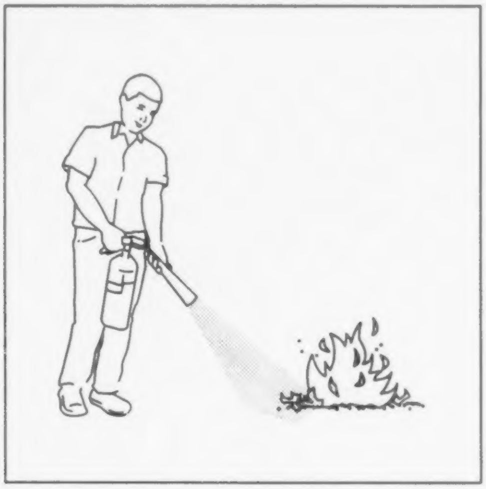
Student Supplement 4

Remember the P-A-S-S sequence when using a portable fire extinguisher.

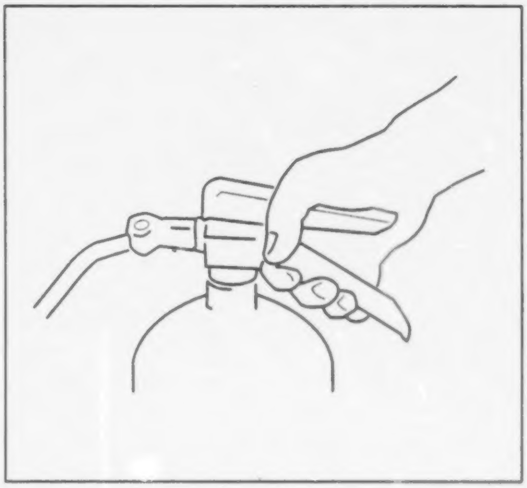
1. **P**ull the pin.



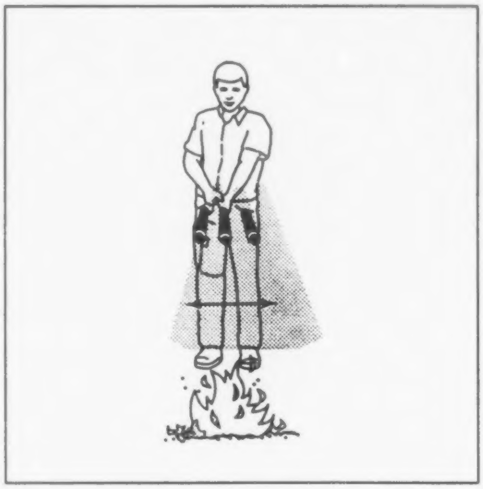
2. **A**im the nozzle at the base of the fire.



3. **S**queeze the handle.



4. **S**weep the nozzle.



Outdoor Safety and First Aid
Unit 1

Student Supplement 5—Outdoor Safety and First-Aid Worksheet

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Directions have been followed	_____
• Answers indicate serious effort was taken in completing worksheet	_____

Introduction: Outdoor work and recreation can be quite rewarding and safe. However, accidents and injuries can happen, so it is important for those involved in outdoor activities to be familiar with outdoor hazards and be able to handle emergency situations.

Directions: Answer the following questions concerning basic safety and first-aid procedures for emergency situations. For help, refer to the information sheet and student supplements found in this unit.

1. Complete the following sentences concerning first-aid procedures for bleeding. Circle or underline the correct words or phrases.

   a. For a case of severe bleeding, the wound should be (packed with gauze) (elevated) to gain control of bleeding.

   b. For minor cuts, (tightly applied tourniquet) (antiseptic cream) should be applied.

2. Correct false statements about first-aid procedures concerning various types of burns. Write the corrected statement on the lines provided.

   a. For an electrical burn, apply a heavy coating of antiseptic cream to the wound and bind with bandages.

   ____

   ____

   b. A second-degree burn should be treated exactly the same way as a first-degree burn, only sooner.

   ____

   ____

Student Supplement 5

c. A good example of a third-degree burn would be a light, but painful, sunburn and treatment should include bathing it in cold water and apply dry, sterile dressing.

____

____

3. List three signs of early stages of traumatic shock.

a. ____

b. ____

c. ____

4. List three first-aid procedures recommended for preventing shock.

a. ____

b. ____

c. ____

5 Complete the following sentences concerning first aid for fall victims. Circle or underline the correct words or phrases.

a. First aid for a fall victim with head injuries should include laying the victim flat and (application of mouth-to-mouth resuscitation) (control bleeding and shock).

b. For less severe falls the proper first-aid action is (check for injury and apply appropriate first aid) (immediately move victim to safe area and seek medical attention).

6. You are sitting in a restaurant and a diner near your table frantically stands up, grasps his throat, struggles and falls unconscious near your table.

a. What is the most likely cause of this person's predicament?

____

b. What should be done immediately in this case?

____

Student Supplement 5

7. List, in order, the four first-aid procedures necessary for treating the victim of an electrical accident.

   a. ______________________

   b. ______________________

   c. ______________________

   d. ______________________

8. Complete the following sentence concerning heat exhaustion. Circle the correct phrase.

   The first action necessary to aid a person suffering from heat exhaustion is (provide the victim with a sports drink) (move the victim to a cool place).

9. List four signs of heat stroke.

   a. ______________________

   b. ______________________

   c. ______________________

   d. ______________________

10. After recognizing the signs of hypothermia the first goal of a rescuer should be to

    ____

11. Animal bites should be treated as any other cut, scrape, or abrasion with the exception of what consideration? ______________________

12. The victim of an allergic reaction to a honey bee sting will show signs of anaphylactic shock. If medical assistance is not available, or is on its way, list three procedures a rescuer can accomplish to help the victim.

    a. ______________________

    b. ______________________

    c. ______________________

13. Select true statements about first-aid procedures for snake bites from pit vipers. Place an "X" in the blanks next to the true statements.

    ______a. Doing nothing is not first aid.

    ______b. The victim should be encouraged to run, or at least hurry, to the nearest vehicle or emergency station.

Student Supplement 5

______c. A tight tourniquet should be applied at the wound to cut off circulation and all possible movement of injected venom.

______d. Do not give the victim liquor.

______e. A constricting band placed between the heart and the fang marks is recommended.

______f. Apply suction to the wound as soon as possible to remove injected venom, even if the suction has to be applied by mouth.

______g. Hot and cold compresses applied every three to five minutes is recommended, while immersing the affected limb in ice water is not.

14. After a tick is removed from the skin, what precautions need to be taken over a period of two weeks? Write a brief answer in the blank provided.

____

15. Once cold water or ice and a topical antiseptic are applied to a spider bite, what pain relievers are recommended?

a. ____

b. ____

16. What items should be included in a basic first-aid kit?

____

____

____

17. Select the color scheme which would be found on the highly poisonous coral snake. Place an "X" in the blank next to the correct color scheme.

______a. Red/Yellow/Red/Yellow/Black/Yellow/Red

______b. Red/Black/Yellow/Black/Red/Black/Yellow

18. The venom of pit vipers (rattlesnakes, copperheads, and cottonmouths) affects which of the following body systems? Place an "X" in the blank next to the correct system.

______a. The nervous system

______b. The circulatory system

Student Supplement 5

19. In what region of the U.S. is one likely to encounter a coral snake? Place an "X" in the blank next to the correct region.

    ______a. The extreme north and west

    ______b. The Central Plains

    ______c. The extreme south and east

    ______d. All of the above

20. In what areas of the U.S. is one likely to encounter a rattlesnake? Place an "X" next to the correct area.

    ______a. In only the western states

    ______b. Throughout the 48 contiguous states of the U.S.

    ______c. The extreme south and east

    ______d. In southwestern Oklahoma

21. Select true statements concerning poisonous plants found in the U.S. Place an "X" in the blanks next to the true statements.

    ______a. Poison ivy is found in all states of the U.S.

    ______b. Poison oak and poison ivy are the same plant.

    ______c. Poison ivy is known to have a series of three leaves.

    ______d. Poison oak is likely to be found in California.

    ______e. Poison sumac is found in the eastern third of the U.S. and can grow to heights of 25 feet.

22. Name the two poisonous spiders found in the U.S.

    a. ______________________________

    b. ______________________________

23. Complete the following statements concerning weather extremes. Circle the correct words or phrases.

    a. To protect oneself from lighting while in rural areas take shelter (under the canopy of trees) (in a vehicle with the windows rolled up).

    b. The rule of thumb for safety while driving in heavy rains is to (only drive through running water that covers the road) (never drive into running water).

Student Supplement 5

c. If a tornado is approaching, seek shelter in (low lying areas) (a vehicle with all of the windows rolled up except one on the downwind side).

d. If one is stranded in an automobile in a heavy show storm, there is a potential hazard of (hypothermia) (carbon monoxide poisoning) from sitting comfortably in the car and running the heater.

24. Label the three sides of the fire triangle.

a. ____________________

b. ____________________

c. ____________________

25. Complete the following statements about fire classes and their symbols. Circle or underline the correct words or phrases.

a. A liquified petroleum gas fire would be classed as (Class B) (Class D).

b. A Class A fire would include one whose fuel was (magnesium) (ordinary combustibles).

c. A machine shop fire in which magnesium shavings ignited would be classed as (Class B) (Class D).

d. A (Class C) (Class A) fire extinguisher should be used on an electrical fire.

Outdoor Safety and First Aid
Unit 1

Assignment Sheet 1—Analyze Scenarios to Determine Appropriate Safety and First-Aid Procedures

Name ______________________ Overall Rating __________

Evaluation criteria	**Rating**
• Directions have been followed	____
• Answers indicate cognitive grasp of unit information and critical thinking	____

Introduction: Clear thinking and basic first-aid training are essential to successfully administer helpful assistance to an accident or trauma victim. As you learned from Student Supplement 1, there is a systematic approach to dealing with first-aid emergencies. In this exercise, you will evaluate various scenarios to determine the proper course of action, or to critique the actions taken based on what you have learned from the information in this unit of instruction.

Directions: Read the following scenarios and answer the questions accompanying each.

1. As a member of a construction crew working to develop a riverside rest area for rafters, you return from lunch to find one of your co-workers slumped against a gasoline trenching machine. The machine is still running, its trenching boom deep in a ditch near the restroom complex. Your friend seems to be unconscious. Based on a systematic look at first aid what is the first thing you should do?

   ____

2. While fishing at a remote high mountain lake you hear a scraping clattering sound on the rocks behind you. As you turn to investigate, you see a bicyclist obviously out of control, falling head over heels down the mountain side from the trail above. She bounces off one last boulder and lands face down in the water at the edge of the lake. She doesn't move. Although you know her neck might be broken, you can't take a chance on her drowning so you carefully pull her from the water and turn her over to take a closer look. In order, what are the first three things you should determine?

   a. ____

   b. ____

   c. ____

3. Julio and Brett are cataloging various native grasses and forbs on the Rita Blanca National Grasslands in far northwestern Oklahoma on a windy late May afternoon. They have walked nearly a mile from their pickup truck and are engrossed in photographing various specimens of buffalograss and occasional Little bluestem clumps when a lightning bolt from a rapidly approaching thunderstorm strikes a few hundred yards away with a deafening BOOM and a

Assignment Sheet 1

flash of heat. The Rita Blanca is open country with no trees and only occasional outcroppings of volcanic rock and few ravines. Evaluate this situation, giving suggestions on how Julio and Brett might have avoided their situation and what actions they might take to reduce their chance of being struck by lightning.

4. As a newly assigned game ranger, you drive out of town to the end of a nearby reservoir on a sunny pre-duck-season afternoon in December. Although wintery conditions have prevailed for the past month or so, the temperature is relatively warm and you think it might be a good day to watch arriving mallard and pintail ducks as they migrate to the south. It would be a good way to spend your first day off in two weeks—just sitting, drinking from a Thermos bottle of coffee and watching the ducks announce the arrival of winter. Sitting in your pickup on a hill above a neck of the lake where much timber remains in the water, you notice a lone late-season fisherman standing up in his small boat to untangle a fishing line caught in a branch. Suddenly, he falls backward into the 40 degree water. You know he has less than an hour to live if he doesn't get out of the water, so you race your truck across the pastureland to try to give him assistance. Once you arrive at lakeside, you realize the man is wearing a personal flotation device and is awkwardly swimming through the tangles of brush and limbs to shore. As you toss a rope out to him, he grasps at it eagerly and thrashes in the water for several seconds before grabbing it...allowing you to pull him ashore. As he stands in the mud gasping for air, he thanks you profusely and complains of cramping cold muscles. He tries in vain to take off his life vest and begins to shake clumsily as you help him toward your pickup truck. Evaluate this man's condition and suggest several steps that can be taken at the scene to help him recover.

5. On a spring-break picnic Jeanette, Stacey, and Nolini were enjoying the sun, eating hot dogs and potato chips and taking a break from mid-term exams and the rigors of school. In their excitement and laughter, Nolini looked on in horror to see Stacey grabbing her throat, red-faced, and struggling. Immediately Jeanette raced to Stacey and performed the Heimlich maneuver several times until a chunk of frankfurter was dislodged from her throat. Describe the Heimlich maneuver and how it is performed.

Assignment Sheet 1

6. While hiking alone across a rocky hillside on a sunny late-fall afternoon in south Texas, LeRhonda rounded a bend in the trail and was terrified to see a large diamond-back rattlesnake sunning itself on a waist-high rock only a few feet in front of her. In her surprise, she lost her footing and fell down a cactus-filled rocky embankment. After the initial pain of cuts and bruises and the fear of falling had subsided, LeRhonda realized the sharp pain in her shin was probably the result of a broken leg. Climbing back to the trail was impossible in her condition and night was near, so she removed a nylon windbreaker from her backpack and put it on. She took a drink from her canteen and decided to make the best of it until someone came along the trail above, or she could get herself out of the predicament. The next morning, when two hikers found LeRhonda they found it difficult to communicate with her about what happened because of her incoherent speech patterns and her inability to speak without gasping. It was evident she had vomited several times throughout the night and she was extremely thirsty. In helping her drink, one of her rescuers noticed she felt cold and her pulse was rapid. Evaluate LeRhonda's condition and describe what actions should be taken immediately.

____

____

____

____

7. As an outdoor recreation instructor for a private youth summer camp in central Tennessee, you have been assigned to lead a day-long nature hike for a group of early teens. The route involves paths through stands of hardwood timber, along lake shores and up steep forested paths to panoramic hill tops. You have explained the possibility of encounters with various poisonous plants and the remote, but real, possibility of encounters with poisonous snakes. As you lead your group across the quiet, damp, leaf-littered forest floor, a boy in the back of the group steps over a log and yells as a sharp pain strikes the calf of his leg. "Snake!," he cries, as he rustles back to the group, limping and clutching his leg. You assemble the others and comfort the boy on a clearing near the path. He describes to you a burning sensation on the back of his leg and says he saw a glimpse of a brownish snake, almost the same color as the fallen leaves, crawling to safety beneath the log. Inspecting the boy's leg you find two distinct fang marks in the middle of the calf muscle. Evaluate this situation (what type of snake do you suspect was encountered, and describe appropriate first-aid measures you would apply.)

____

____

____

____

____

Assignment Sheet 1

8. After cooking breakfast over a small open fire at your campsite near a stream in a national forest, you are ready to pack your gear and resume your weeklong hiking vacation. Using your knowledge of the fire triangle, what will you do with the campfire to ensure it will not become a problem after you leave?

9. As a member of a contract crew renovating a playground, you find yourself assigned the task of planting grass on bare spots left by years of hard play. Part of the process involves applying ammonium nitrate fertilizer to the areas to give the new grass adequate fertility to cover the area quickly. You are not familiar with ammonium nitrate and you're not really certain what it is or what hazards it might represent. Where can you get more information about the substance before you begin handling it?

10. As an employee of a recycling business, you are operating a baling machine that compresses scrap paper into 500-pound square bales for shipping. You become aware of a smoky smell drifting through your workplace. Upon investigating further, you find a carelessly discarded cigarette has caused a bin of scrap newsprint to catch fire. With your knowledge of the different types of fire extinguishers and fires, describe the classification of this fire, and what type of fire extinguisher should be readily available to fight it.

Outdoor Safety and First Aid
Unit 1

Assignment Sheet 2—Interpret Portable Fire-Extinguisher Symbols

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	______
• All answers are correct	______

Introduction: When a fire occurs, it is very important not only to be able to size-up and identify the type of fire, but also to choose an extinguisher that will be effective in putting out the fire.

Directions: Review the material presented in Objective 10 of the information sheet, and locate and study the information presented in Student Supplement 4.

Next, read and follow the directions with each item below.

1. Match extinguisher picture symbols with the extinguisher's intended applications. Write the corresponding numbers on the blanks provided.

______a. Class A and B fires but not Class C fires

______b. Flammable liquids

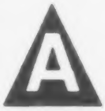
______c. Class B and C fires but not Class A fires

______d. Ordinary combustibles

______e. Class A fires but not Class B and C fires

______f. Electrical equipment

1.



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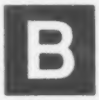

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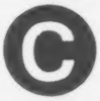

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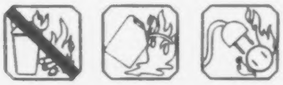

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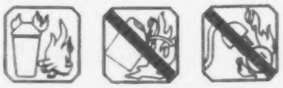

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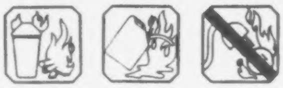
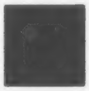
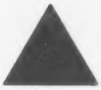
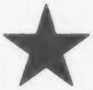


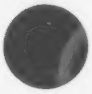
Assignment Sheet 2

2. Write on the blank the correct fire-class letter that would appear in the center of each of the following extinguisher symbol shapes. Beside each shape write the color associated with the shape.

______a.  ________________________

______b.  ________________________

______c.  ________________________

______d.  ________________________

3. Complete fire-extinguisher general operating instructions that follow the letters P-A-S-S.

a. P____

b. A____

c. S____

d. S____

Outdoor Safety and First Aid
Unit 1

Assignment Sheet 3—Read Wind Chill Index and Water Survival Charts

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	______
• Answers are correct	______

Introduction: As information in this unit has shown, survival in cold conditions becomes more difficult as temperatures drop and winds increase. This exercise will sharpen your chart reading skills and will reinforce the importance of taking precautions to protect yourself in cold conditions.

Directions: Read the following scenarios and answer the questions accompanying each according to the charts printed here.

Water Survival Chart

If the Water Temp. (°F) Is...	Exhaustion or Unconsciousness Occurs In...	Expected Time of Survival Is...
32.5	Under 15 Minutes	Under 15-45 Minutes
32.5-40.0	15-30 Minutes	30-90 Minutes
40-50	30-60 Minutes	1-3 Hours
50-60	1-2 Hours	1-6 Hours
60-70	2-7 Hours	2-40 Hours
70-80	3-12 Hours	3-Indefinitely
over 80	Indefinitely	

1. What is the expected time of survival of a human in the water if the water temperature is 57 degrees?

   ____

2. Water temperatures at the sinking of the *Titanic* in 1912 were estimated to be about 32 degrees F. How long do you think most victims survived in the icy waters around the sinking ship?

   ____

Assignment Sheet 3

3. As the result of a night boating accident an individual is pitched into 45 degree water. Although the victim is wearing a life preserver, unconsciousness from hypothermia can be expected to occur in ______ to ______ minutes.

Wind Chill Index

Estimated Wind Speed in MPH	Actual Thermometer Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Temperature (°F)											
Calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−21	−38	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−36	−45	−58	−72	−88	−89	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−124
25	30	16	0	−15	−29	−44	−59	−74	−83	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−107	−128	−140
35	27	11	−4	−20	−35	−49	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER* (for properly clothed person)				INCREASING DANGER*			GREAT DANGER*				
	*DANGER FROM FREEZING OF EXPOSED FLESH											

4. If the actual thermometer reading is 50 degrees F. and the wind is 30 miles per hour, what is the equivalent wind chill reading? ______________________________

5. Given a winter afternoon temperature reading of 10 degrees F. and north wind of 20 miles per hour, the equivalent wind chill reading is ______________________________

6. The wind chill reading is −2 degrees F. and the wind speed is 30 miles per hour. What is the actual thermometer reading? ______________________________

Outdoor Safety and First Aid
Unit 1

Job Sheet 1—Demonstrate the Heimlich Maneuver for an Adult Choking Victim

Name ______________________ Attempt Number ____________

Date ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Procedure was performed at proper speed	______
• Hands were positioned accurately	______
• Procedure was performed smoothly (performed from memory)	______

Introduction: A foreign body or obstruction of a person's airway usually occurs during a meal, with meat the most common cause of choking. Other factors that contribute to choking incidents are

- Drinking excessive amounts of alcohol before and during a meal,
- Trying to eat large pieces of food, particularly if the individual wears dentures, and
- Talking and laughing with the mouth full.

A victim with complete obstruction of the airway cannot talk or cough and usually grasps his or her throat in a universal reaction to choking. A victim suffering partial obstruction may be coughing, choking, wheezing, turning blue, or exhibiting a combination of these symptoms as well as displaying the universal distress signal.

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the above criteria.

A. Equipment and materials

- CPR dummy

Caution: Do not perform this maneuver on a fellow student or co-worker. Injury may result. Use a CPR dummy for practice.

B. Procedure

☐ 1. Ask, "Are you choking?"

☐ 2. If the victim can speak or is coughing, stand back and allow the victim to continue to try to dislodge the obstruction.

☐ 3. If the victim cannot cough or speak, apply the Heimlich maneuver to dislodge the object obstructing the airway.

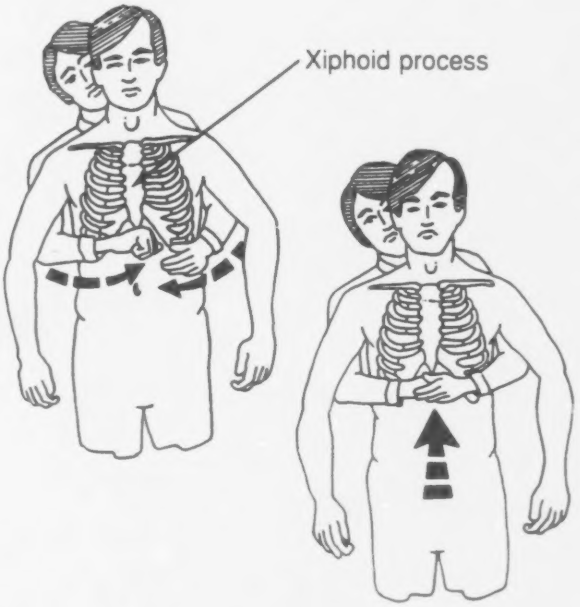
Job Sheet 1

☐ a. Stand behind a standing or sitting "victim" (CPR dummy), and wrap your arms around the victim's waist.

☐ b. Make a fist with one hand, and place the thumb side of your fist against the victim's abdomen, slightly above the navel and well below the xiphoid process (Figure 1).

Caution: Correct hand position is very important. Compressing the xiphoid process can result in broken ribs that can lacerate the lungs or other internal organs.

Figure 1



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☐ c. Grasp your fist with your other hand, and press the fist into the victim's abdomen 6 to 10 times with quick, inward and upward thrusts.

Note: Each thrust should be delivered with the intent of releasing the airway obstruction.

Evaluator's comments: ______________________________

____

____

____

Outdoor Safety and First Aid
Unit 1

Job Sheet 2—Operate a Fire Extinguisher

Name ______________________ Attempt Number ____________

Date ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Extinguisher was carried properly	______
• User was within stream reach of fire	______
• P-A-S-S sequence was followed	______
• Fire was completely extinguished	______

Introduction: Using a portable fire extinguisher properly requires more than simple manipulation. You must always size up the fire and decide whether it can be extinguished with an extinguisher. If the fire is too large or too smoky, call the fire department. If the fire is small enough to be extinguished with an extinguisher, always fight it with your back to a means of escape.

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the above criteria.

A. Equipment and materials

- Portable fire extinguisher suitable for a Class A fire
- **Small** Class A fire in clear, safe area
- Charged hose (hose hooked up to a water source and with water in the hose) or another secondary means of extinguishment for backup

> **Caution: This procedure should only be performed outdoors on a windless day and only under the direct supervision of your instructor.**

B. Procedure

☐ 1. Pick up the fire extinguisher by its handle.

Note: All modern fire extinguishers are designed to be used in an **upright** position.

☐ 2. Read the fire extinguisher label to determine proper stream reach.

Note: *Stream reach* is the distance the extinguishing agent is propelled. Stream reach varies with extinguisher, and may range from 3 to over 20 feet. Normally, the smaller the extinguisher, the shorter the stream reach.

Job Sheet 2

☐ 3. Walk—do not run—to within stream reach of the fire.

☐ 4. **Pull** the pin at the top of the extinguisher that keeps the handle from being pressed.

Note: Pulling the pin automatically breaks the plastic or thin wire inspection band.

☐ 5. **Aim** the nozzle toward the fire, first releasing it from its clip if applicable.

☐ 6. **Squeeze** the discharge handle (above the carrying handle) to release the extinguishing agent.

Note: The discharge handle can be released at any time to stop the discharge.

☐ 7. **Sweep** the nozzle back and forth at the base of the flames.

☐ 8. After the fire appears to be out, probe for remaining hot spots.

☐ 9. Make sure the fire is out by extinguishing any hot spots.

Evaluator's comments: ______________________________

Outdoor Safety and First Aid
Unit 1

Job Sheet 3—Lift a Heavy Object Properly

Name ______________________________ Attempt Number ____________

Date ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Load was safely lifted	_____
• Load was safely carried and set down	_____

Introduction: The number-one worker injury in America today is back strain or injury. Most of these injuries come from trying to lift an object that is too heavy or from lifting an object improperly. It is very important, therefore, that you learn to assess the weight of a load to be lifted, and either get help to lift the load or lift the load properly, using your leg muscles, not your back.

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the above criteria.

A. Equipment and materials

- Large, heavy box
- Gloves
- Lower-back support belt

B. Procedure

☐ 1. Put on gloves and lower-back support belt.

☐ 2. Size up the load.

☐ 3. Place your feet close to the object and 8 to 12 inches apart for good balance.

☐ 4. Bend your knees to a degree that is comfortable.

☐ 5. Grip the box firmly with both hands.

☐ 6. Keeping your back straight and using your leg muscles, lift the box to waist height and hold close to your body.

Caution: Do not make any turning or twisting motions until the lift is complete.

☐ 7. Turn by changing foot position, making sure that your path is clear.

Job Sheet 3

☐ 8. Carry the box to the new location, using a normal walking gait and keeping your view unobstructed.

☐ 9. Reverse the lifting procedure to set the box down, taking care to bend your knees, keep your back straight, and avoid setting the box on your fingers or feet.

Evaluator's comments: ______________________________

Natural Resources and Conservation
Unit 2

Objective Sheet

Unit Objective

After completing this unit, the student should be able to explain the importance of natural resources and distinguish between renewable and nonrenewable resources and preservation and conservation of natural resources. The student should demonstrate these competencies by completing the assignment sheets and job sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to natural resources and conservation with their definitions.
2. Explain the difference between renewable and nonrenewable natural resources.
3. Name the four basic components of the physical environment.
4. Select true statements concerning the history of natural resources.
5. Explain the importance of natural resources.
6. Give four examples of conflicts in natural resource management.
7. List four factors which affect natural resources.
8. Distinguish between preservation and conservation of natural resources.
9. List preservation activities.
10. List two activities to conserve each of the natural resources.
11. Match categories of solid waste with the descriptions.
12. Select true statements concerning the composition of solid waste in a typical municipal landfill.
13. Complete statements concerning methods of waste disposal.
14. Select true statements concerning waste reduction activities.
15. Distinguish between recyclables and nonrecyclables.
16. Match federal agencies responsible for natural resources with their descriptions.
17. List types of occupations in natural resources.

Objective Sheet

18. List ways of getting a job in natural resources.
19. List characteristics of a person working in natural resources.
20. Report on a local natural resource problem. (Assignment Sheet 1)
21. Report on a current event affecting natural resources. (Assignment Sheet 2)
22. Identify recycling centers in your area. (Assignment Sheet 3)
23. Identify occupations in natural resources in your area. (Assignment Sheet 4)

Advanced Applications (Optional)

1. Trace route of recyclable products. (Assignment Sheet 1A)
2. Complete a class community service project. (Assignment Sheet 2A)
3. Analyze current reports concerning natural resources and conservation conflict areas. (Assignment Sheet 3A)
4. Build and use a composting site. (Job Sheet 1A)

Natural Resources and Conservation
Unit 2

Information Sheet

1. **Terms and definitions**

   a. **Biodegradable**—A material that decomposes in the environment as a result of the activity of microorganisms

   Note: Products vary in the amount of time they require to degrade, from a few weeks to thousands of years. However, many highly biodegradable products buried in landfills, out of the sunlight and away from oxygen, lie for years without significant deterioration.

   b. **Degradation**—Lowering quality of a resource

   c. **Depletion**—Using up the total quantity of a resource

   d. **Ecosystem**—A unit of the environment comprising the interaction of all organisms and the physical components within a given geographic area

   Note: Despite its popular use in planning and decision making, there is no popularly accepted scientific definition of the word "ecosystem."

   e. **Ecologist**—One who studies the relationship between organisms and their environment

   f. **Endangered species**—A species in immediate danger of becoming extinct

   g. **Environmental impact**—Changes in the environment caused by some form of management

   Note: Environmental impact can be positive, negative, or inconsequential.

   h. **Fossil fuels**—Hydrocarbon compounds derived from the remains of organisms buried millions of years ago

   i. **Global**—Involving the world

   j. **Hazardous (toxic) waste**—Waste material that poses a threat to human health

   k. **Natural resources**—Land, water, air, wildlife, sunlight, and human labor

   Note: Resources are defined as anything that can be relied upon to fill a need. Natural resources, therefore, would be those things in nature upon which humans depend for food, shelter, clothing, transportation, and recreation.

   l. **Ozone (03) layer**—Layer of the atmosphere that protects the earth from ultraviolet radiation in sunlight

   m. **Pollution**—A reduction in the quality of the environment by the introduction of impurities

Information Sheet

n. **Protected species**—A species whose life, habits, and habitat are protected by law

o. **Recycling**—Transforming waste products into new products

p. **Urbanization**—Growth or expansion of cities

q. **Waste**—Useless, unwanted, or discarded material

Note: Many times waste products are quite valuable once a use or market for them has been found. For example, millions of cubic feet of natural gas are flared each day in the Middle Eastern oil fields, because there is no ready pipeline to transport the clean-burning fuel to distant populated areas.

2. Types of natural resources

a. Renewable natural resources—Resources which can be replaced after they have been used

Examples:

- Plants—Trees can be cut for lumber; then small seedlings can be planted to replace them. (Most paper products come from forest plots planted specifically for harvest for paper mills.) Grass can be cut for animal forage and replaced by nature.

- Animals—Livestock, fish, and game animals can be used for food and replaced by reproduction and relocation.

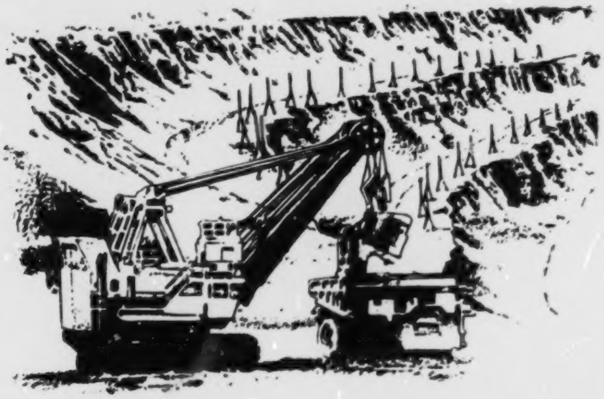
Note: Although animals reproduce naturally and their populations respond to various pressures applied to them, if their natural cycles and habitats are severely damaged, they can become extinct.

Information Sheet

b. Nonrenewable natural resources—Resources which cannot be replaced in a lifetime after they are used

Examples:

- Fossil fuels—Formed by decaying vegetation (coal) and animal life (oil and gas)



- Soil and other minerals such as sand, iron, lead, gold, and aluminum that are formed by different arrangements of atoms in the earth's crust

3. **Basic components of the physical environment**

a. Air

- Is vital to plants and animals for respiration (oxygen/carbon dioxide exchange)
- Can be contaminated by pollutants from industry, automobiles, and dust from construction, and agricultural and other human activities

b. Water

- Is vital to all organisms
- Can be contaminated by sewage, industrial waste, runoff from unprotected soil, and municipal storm runoff

c. Soil (and its minerals)

- Is critical to all life because it supports vegetation which begins the food chain
- Forms very slowly; may take thousands of years to produce enough to sustain vegetation
- Can be destroyed or dislocated by wind, floods, and human activities such as construction, farming, logging, and mining

Information Sheet

d. Sunlight

- Is critical to all life which needs light and heat
- Is the basic source of all energy on earth

4. History of natural resources

a. Humans have always used natural resources.

b. Industrial progress is built on the use (and sometimes abuse) of many natural resources.

c. When world and national populations were small, natural resources were so abundant there was little need for conservation of natural resources.

d. As populations increase, natural resources tend to become scarce.

e. Proper management of natural resources is necessary to prevent their depletion.

5. Importance of natural resources

a. Humans must have air, water, food, and shelter to survive.

Note: Sunlight is necessary for the production of food and the materials for many forms of shelter.

b. Since many natural resources are unevenly distributed throughout the world, economics and politics play important roles in distributing these sometimes scarce commodities.

c. A great threat to human survival is the degradation and depletion of natural resources.

6. Conflicts in natural resource management

a. As populations increase, demands for natural resources increase.

b. As natural resources are used, demands for their protection increase.

c. Conflicts between use and preservation of natural resources are inevitable.

d. Continuous adjustments and compromise between consumers and protectors of natural resources are necessary.

Note: There is no "pure" consumer nor "pure" protector of natural resources. Across the world, all people are consumers of natural resources. Some are producers of goods derived from renewable and nonrenewable natural resources; others are mainly consumers of those goods. Consumers who realize the need to conserve and wisely manage natural resources sometimes become "protectors," but they still remain consumers.

Information Sheet

e. Examples of conflict include:

- Wetlands needed by wildlife are drained and used for crop production.
- Agricultural land needed for food production is paved in urban development.
- Publicly owned forests needed for recreation are harvested for timber.
- Publicly owned forests needed for lumber (and the jobs involved in the timber industry) are placed off limits for harvest by recreation and preservation interests.
- Hunting is resisted by animal rights activists.
- Many development and agricultural activities destroy wildlife habitat.
- Swamps supporting a diversity of plants and animals are drained for urban and suburban development.
- Recreational uses of rural land can disrupt wildlife, and damage vegetation and landscapes.
- Fossil-fuel-fired electrical generation plants pollute the air of people who use electricity.
- Nuclear-powered electrical generation plants maintain clean air, but produce highly toxic waste products which must be stored and protected.
- Agricultural chemicals aid in producing abundant food supplies, but can adversely affect surface and ground water.
- Vehicles needed to transport people to their work places increase air pollution.

7. Factors which affect natural resources

a. Natural occurrences

Examples: Droughts, floods, earthquakes, and volcanic eruptions

b. Air, water, and land pollution

Air Pollution

Water Pollution

Land Pollution

Examples:

- Air pollution from industrial emissions, automobile exhaust, dust, and smoke
- Water pollution from domestic and municipal sewage entering waterways before proper treatment; industrial waste improperly disposed of in landfills that moves into ground or surface water
- Land (soil) pollution from pesticides, toxic waste, acid rain, and solid waste on the land

c. Urbanization

Example: Elimination of natural wildlife habitats

d. Agricultural practices

Examples: Improper use of pesticides, soil erosion, and clearing forest or wetlands for crop production

e. Mining practices

Example: Strip mining that clears all surface vegetation during mining process

f. Drilling practices that may result in contamination of resources

Example: Naturally occurring salt water getting into fresh water formations as a result of drilling

8. Preservation and conservation of natural resources

a. Preservation—Provides for the use and enjoyment of certain areas while leaving them unaltered for future generations

b. Conservation—Promotes the use of natural resources in a manner which minimizes waste, encourages renewal, and maintains that resource for future use

9. Preservation activities

Note: Although to many, preservation is the maintenance of a geographic area without human intervention or access, in this study preservation includes conservation activities also. For instance, many "preservationists" are adamantly opposed to all hunting activities by humans and seek to stop the practice in the name of preserving wildlife. However, without wise management of wildlife populations, wild fluctuations of wildlife populations would occur as a result of disease and starvation and unchecked birthrates. So, the management of wildlife populations through legally prescribed hunting practices, relocation, and habitat improvement are vital to maintaining or "preserving" a viable number of wildlife—a valuable natural resource.

a. Protect native animals and plants

Information Sheet

b. Protect migration routes and preserve suitable areas for migratory animals.

c. Manage harvested species (game animals) through the use of fishing and hunting regulations.

d. Identify and protect endangered species and the ecosystems on which they depend.

e. Protect natural landscapes.

f. Restore and replant land areas altered by human activity.

g. Prevent wetland drainage for domestic or industrial use.

h. Manage fires either by extinguishing or by allowing them to burn themselves out if they benefit the ecological plan of the area.

i. Manage surface and ground water by controlling erosion and preventing pollution.

j. Manage air quality to protect human health, vegetation, visibility, wildlife, and fish.

k. Manage soils to prevent soil erosion, physical removal, or contamination by waste disposal.

10. Conservation activities

a. Air conservation activities

- Since cars are major air polluters, keep your car tuned up, change fuel filters often, maintain emission control devices, and use unleaded gasoline.
- Drive less, ride more. Use mass-transit, carpools, bicycles, or walk to work.

  Note: The less you use your car, the less pollutants you put into the environment.
- Avoid using toxic chemicals released into the air such as oven cleaners and window cleaners. Instead use water and soap, baking soda, or vinegar.
- Protect the environment from chlorofluorocarbons (CFCs) which are thought to deplete the ozone layer. Check you automobile for air-conditioning leaks which can release CFCs.
- Plant trees. These use carbon dioxide and produce oxygen. Trees also help to purify the air, moderate temperatures, and absorb noise.

b. Water conservation activities

- Use low-flow shower heads. Short showers also use less water than baths.
- Use faucet aerators for each sink.
- Run washing machines and dishwashers only when they are full.

Information Sheet

- Do not let faucets run while hand-washing dishes, brushing teeth, or shaving.
- Water plants and lawns only as needed, and only in the morning to reduce evaporation.
- Use fertilizers and pesticides conservatively to prevent groundwater contamination.
- Fix leaky faucets or toilets.

c. Soil (land) conservation activities

- Keep soil covered with grass, ground covers, trees, and plants to prevent erosion.
- Use recommended conservation practices such as crop rotation, residue management, contouring, and terracing to protect the soil's fertility and to prevent erosion.
- Do not send toxic substances such as oil, pesticides, or batteries to the municipal landfill.

  Note: Call your fire department about disposing of toxic waste.

d. Energy conservation activities

- Seal leaks and cracks around doors and windows with caulking and weather stripping.
- Increase the insulation in your home to the maximum recommendation.
- Drive fuel-efficient vehicles.
- Use mass-transit, carpools, bicycles, or walk.

  Note: This cuts down on the fuel used as well as decreases air pollutants.
- Set hot water heater at 120°F instead of 140°F.
- Use a cooler wash and cooler rinse in washing machines.
- Turn down the heater at night.
- Use fluorescent lights instead of incandescent.

  Note: Fluorescents use only one-fourth of the energy.
- Turn lights and TV off when not using them.
- Check for leaks around the refrigerator door. Also check the temperature. Set at 38°-42°.

Information Sheet

- Use high-efficiency appliances and those with energy-saving features.
- Use microwave ovens and pressure cookers because they use less energy, and save time too.
- Use alternative energies (solar, wind) where possible to lessen demand on nonrenewable energies (fossil fuels).

  Example: Dry laundry on a clothesline instead of in a drier.
- Use products that are recycled, recyclable, repairable, refillable, reusable, and long-lasting.

  Note: In the case of aluminum cans, it takes only five percent of the energy required to make a new can to recycle a used can and put it back on the shelf again.

11. Categories of solid waste

a. **Agricultural**—Solid waste from raising, slaughtering, and processing animal products and from orchards and field crops

b. **Commercial**—Waste from stores, offices, and other activities that do not actually turn out a product

c. **Industrial**—Waste from industrial processes and manufacturing

d. **Institutional**—Waste from educational, health care, and research facilities

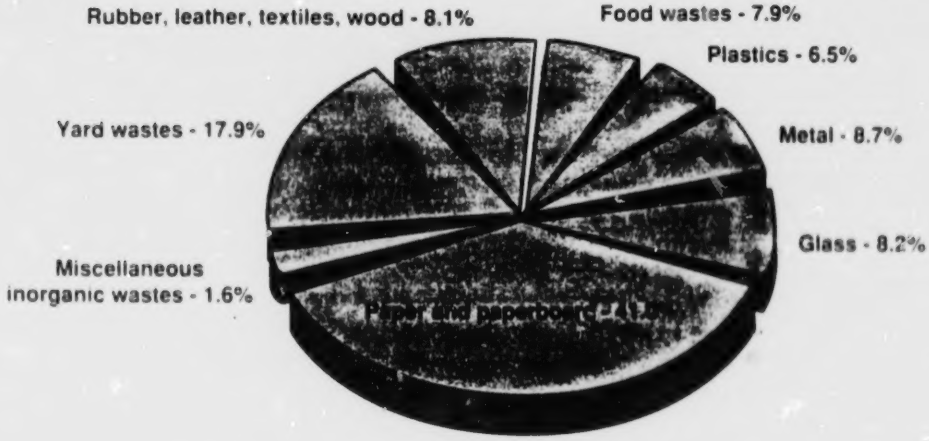
e. **Pesticide**—Residue from the manufacturing, handling, and use of chemicals designed to kill plant and animal pests

f. **Residential**—Waste that usually originates in homes

Note: Hazardous waste may originate at several of these sources. It must be separated from non-hazardous waste and be handled very carefully because it is toxic.

Information Sheet

12. Composition of solid waste in a typical municipal landfill



13. Methods of waste disposal

a. Landfills

- Trash is dumped, and earth-moving equipment covers area with soil.
- Currently 80% of trash goes to landfills.
- Landfills are reaching capacity in many locations.
- Fewer landfills are being built because land is not available (in highly populated areas), land is not suitable (too close to underground water or wetlands), or community groups oppose the landfill sites (the NIMBY—Not In My Backyard—Syndrome).
- Improperly sited and maintained landfills contaminate the groundwater.
- Properly designed landfills include impermeable liners, leachate collection systems, and groundwater monitoring devices.
- Landfills will continue to be needed for wastes such as noncombustibles, nonrecyclables, and incinerator ash.

b. Incineration

- Combustible trash is burned which produces heat and energy that can be used. (Co-generation)
- About 10% of trash is incinerated (with or without energy recovery).
- Trash should be separated to only combustible trash.

Information Sheet

- Faulty incinerators create air pollution and toxic ash by-products, especially if toxic materials are not separated out.
- Newer incinerators use advanced combustion systems, state-of-the-art air pollution controls, and restrictions on the kinds of waste that may be burned. These measures reduce air pollution significantly.
- The advantage of incinerators is that they reduce the volume of refuse by 90%.

c. Recycling

- This involves collecting, separating, processing, and marketing wastes such as glass, metals, and paper.
- About 10% of trash is recycled.
- Recycling can divert potentially large volumes of trash from landfills and incinerators, and can help conserve natural resources such as trees and oil.
- Materials that are recyclable must be separated before they can be recycled.
- The challenge of making recycling economically feasible is to have a stable market for recycled products where supply equals demand.
- Technology for collecting and processing recyclables is improving.

  Note: Plastics that used to be considered nonrecyclables are now being recycled.

14. Waste reduction activities

a. Source reduction—eliminating waste before it happens

Note: This has been compared to preventive medicine which stops the problem before it becomes a problem.

- Minimize the volume and toxicity of products at the source—from designers and manufacturers.

  Examples: Using less packaging and making products that can be recycled

- Make goods more durable so that longer periods of time elapse before they are discarded.

  Examples: Radial tires that last 80,000 miles instead of 30,000; appliances that last 20 years or more

- Consumers can encourage manufacturers to reduce waste by buying products that have less packaging, are free of toxins, are recycled or recyclable, and that are more durable.

Information Sheet

b. Recycling—transforming waste into new products

Examples: Newspapers and greeting cards printed on recycled paper

c. Careful buying—knowing what to buy and what to avoid

- What to buy
  - Products in concentrated forms
  - Products in bulk
  - Products made from recycled materials
  - Products that can be recycled

    Example: Plastic milk bottles instead of cartons that cannot be recycled

  - Paper trash bags instead of plastic bags
  - Cloth napkins and towels instead of paper
  - Products that can be reused

    Example: Ceramic mugs instead of polystyrene

  - Rechargeable batteries
  - Products that last longer

    Example: Radial tires

- What to avoid
  - Over-packaged products
  - Throwaway items

    Example: Nonrefillable ball point pens

  - Clothes requiring dry cleaning
  - Disposable diapers
  - Paper towels and napkins
  - Colored paper products
  - Excess food that will go to waste

15. Recyclables and nonrecyclables

a. Recyclables

- Materials
  - Paper—Newspapers, corrugated boxes, and office paper
  - Plastic—Milk and soft drink containers
  - Glass—Bottles and jars
  - Aluminum—Cans
  - Steel—Appliances
  - Scrap metal—Food cans
  - Wood—Pallets and lumber
  - Motor oils

Information Sheet

- Compost
  - — Leaves, grass, and brush
  - — Food wastes—vegetables, not meat
  - — Some other organic materials, such as paper contaminated with food

Note: Experts estimate that as much as 50% of all U.S. solid waste is recyclable.

b. Nonrecyclables

- Wastes heavily contaminated by food residues, household chemicals, or dirt
- Composite materials

  Examples: Boxes made of paper, foil, and adhesives, plastic-coated paper, furniture, and appliances (other than their metal content)
- Miscellaneous inorganics, such as street sweepings

16. Federal agencies responsible for natural resources

a. Department of the Interior

- National Park Service—Manages more than 300 areas within the national parks system
- Fish and Wildlife Service—Helps protect the nation's birds, mammals, fish, and other wildlife
- Bureau of Land Management—Manages federal grasslands, prairie, desert, forest, and other open spaces of the nation's public lands
- Bureau of Indian Affairs—Works to promote the welfare of the nation's Native Americans and their lands
- U.S. Geologic Survey—Conducts surveys of the land and its resources and develops maps based on these surveys
- Bureau of Mines—Works to ensure efficient mining, processing, use, and recycling of mineral resources
- Bureau of Reclamation—Works to develop water, land, energy resources, and other natural resources in the western United States

b. Department of Agriculture

- Forest Service—Works to manage and protect forestland and grassland while promoting their best use
- Natural Resources Conservation Service—Helps prevent soil erosion from wind and water by working with local soil and water conservation districts and assisting in individual conservation plans and other conservation measures

Information Sheet

- Agricultural Stabilization and Conservation Service—Administers programs with funding for agricultural conservation activities and administers farm programs

c. Environmental Protection Agency—Determines environmental standards and enforces federal environmental laws

d. Department of Energy—Oversight of nuclear power research in several laboratories across the nation

e. Department of Defense—Responsible for environmental impact of nation's network of military bases

f. U.S. Army Corps of Engineers—Responsible, along with U.S. Fish & Wildlife Service, for environmental integrity of federal land and navigable public waterways

17. **Types of occupations in natural resources**

a. Occupations that manage natural resources

Examples: Biologists, wildlife managers, foresters, soil conservationists

b. Occupations that collect and harvest natural resources

Examples: Miners, farmers, loggers, anglers, commercial fisheries

c. Occupations that make products from natural resources

Examples: Manufacturers, processors

d. Occupations that use products made from natural resources

Examples: Consumers

e. Occupations that convert natural resources to energy

Examples: Power plants, fuel companies

f. Occupations that provide services

Examples: Salespeople, truckers, engineers, teachers, technicians

g. Occupations that enforce laws affecting natural resources

Examples: Rangers, agents, EPA officials

h. Occupations that dispose of waste

Examples: Solid waste managers, trash collectors, recycling center employees, environmental scientists

Information Sheet

18. **Getting a job in natural resources**

    a. Identify government agencies and private industries that have jobs of interest to you.

    b. Become familiar with businesses and industries involved with natural resources.

    c. Request information and brochures related to your interests.

    d. Get job-related experience as soon as possible.

    e. Determine education required for various jobs.

    f. Secure summer employment or volunteer work in a related area.

    g. Get to know local individuals working in natural resources.

19. **Characteristics of a person working in natural resources**

    a. Desires to work outdoors

    b. Desires to work in agricultural-related areas

    c. Has a concern for the environment

    d. Likes to interact with the natural environment

    e. Likes to work with people

Natural Resources and Conservation
Unit 2

Assignment Sheet 1—Report on a Local Natural Resource Problem

Name ______________________ Overall Rating ____________

Evaluation criteria	Rating
• Problem selected is appropriate	____
• Report is thorough	____
• Report is accurate	____
• Report is neat and legible	____

Introduction: Proper management of natural resources is critical to the health, prosperity, and lifestyle of the people who use them. Since we are all consumers of natural resources, it is our responsibility to protect and conserve these resources for future use.

Directions: Select a problem which is adversely impacting natural resources in your community or area. Research the problem, and then write a report containing the following information:

- Name of impacting factor (problem)

  Examples: Air pollution, water pollution, soil erosion, wildlife/habitat depletion, and solid waste

  Note: More than one factor may be used since they may act together. For example, soil erosion may cause muddy streams which affect fish species and production.

- Cause of impacting factor
- How it is affecting natural resources
- Solution to the problem
- Expected result if implemented

The report should adequately cover the subject. Length may be specified by the instructor.

Natural Resources and Conservation
Unit 2

Assignment Sheet 2—Report on a Current Event Affecting Natural Resources

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Event selected is appropriate	_____
• Subject is covered well	_____
• Presentation is informative	_____

Introduction: Some of the best ways to stay informed about the world and what is going on around us is to read local, state, and national newspapers (*USA Today*) and news magazines such as *U.S. News and World Report*, *Time*, and *Newsweek*. Articles about natural occurrences or other factors that affect the earth and our environment often appear in these as well as other publications. Floods, fires, earthquakes, oil spills, toxic chemical spills, and waste disposal are just some of the reported events that affect natural resources. By becoming aware of these problems and studying their impact on our environment, we can help find solutions to these problems and protect our natural resources.

Directions: Select a current event such as a forest fire, flood, earthquake, etc. and collect current newspaper and magazine articles which discuss this event and how it is affecting natural resources. Analyze the problem and evaluate the solution. Think of other solutions that might be more effective. Then, prepare a five-minute oral presentation on the subject. Answer the following questions in your report:

- What natural resources are being affected?
- How are they being affected? (the problem)
- What is being done about it? (the solution)
- Is the solution effective? Why or why not?
- What other solutions might be more effective?

Practice for your presentation.

Natural Resources and Conservation
Unit 2

Assignment Sheet 3—Identify Recycling Centers in Your Area

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Assignment is neat	_____
• Assignment was completed on time	_____
• Centers are listed	_____
• Products for recycling are listed	_____

Introduction: Many recyclable materials can be found in the average household. Newspapers, plastic milk and soft drink bottles, glass bottles and jars, and aluminum cans are some examples. If consumers would take the time to separate their garbage and take the recyclable materials to their nearest recycling center or pickup area, as much as half of what we discard could be recycled. And some recyclable materials such as newspaper and aluminum are often collected by groups as a fundraising project and sold to recycling centers.

This assignment will help you become familiar with the locations of the recycling centers in your community and the products that are accepted for recycling.

Directions: Use the telephone book to make a list of recycling centers in your area. Call or visit them to determine the types of products that they recycle.

Recycling Centers	Products for Recycling
1.	
2.	
3.	
4.	
5.	

Natural Resources and Conservation
Unit 2

Assignment Sheet 4—Identify Occupations in Natural Resources in Your Area

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Occupations listed are in natural resources	_____
• Explanation is logical	_____
• Assignment was completed on time	_____
• Assignment is neat and legible	_____

Introduction: As you learned in Objective 17, there are many types of occupations in or related to natural resources. For individuals who enjoy working outdoors and interacting with the natural environment, a career in natural resources may be desirable.

This assignment will help familiarize you with career opportunities in your area.

Directions: Contact the local Chamber of Commerce, use the phone directory, visit with the school guidance counselor, and/or use materials furnished by the instructor to identify occupations in or related to natural resources in your area. List those occupations of interest to you and briefly explain why you think you might like that type of work.

1. Occupation: ______________________________

   Explanation: ______________________________

   ____

   ____

2. Occupation: ______________________________

   Explanation: ______________________________

   ____

   ____

3. Occupation: ______________________________

   Explanation: ______________________________

   ____

   ____

Assignment Sheet 4

4. Occupation: ____________________

Explanation: ____________________

____

____

5. Occupation: ____________________

Explanation: ____________________

____

____

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Water Resource Management
Unit 3

Objective Sheet

Unit Objective

After completing this unit, the student should be able to discuss the ground water/surface water relationship and the physical/chemical considerations necessary to manage this vital natural resource. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to water resource management with their definitions.
2. Select true statements concerning the history of the importance of water in the United States.
3. Complete statements concerning water distribution.
4. List uses of water.
5. Complete statements concerning the hydrologic (water) cycle.
6. Complete statements concerning surface water.
7. Select true statements concerning ground water.
8. Describe the relationship between ground water and surface water.
9. Select true statements concerning water pollution.
10. Compare the state of the environment of 1960 and 1995.
11. Select true statements concerning hazardous/toxic waste.
12. Match federal legislation for environmental protection of water resources with their intended purposes.
13. Select true statements concerning watersheds.
14. Match water measurement terms with their definitions or equivalents.
15. List career opportunities in water resource management.
16. Survey your area to identify water pollution sources. (Assignment Sheet 1)
17. Evaluate your source of drinking water. (Assignment Sheet 2)

Objective Sheet

18. Calculate water measurements. (Assignment Sheet 3)
19. Calculate the cost of water. (Assignment Sheet 4)

Advanced Applications (Optional)

1. Calculate and draw conclusions from water measurements. (Assignment Sheet 1A)
2. Determine ways to reduce home water consumption. (Assignment Sheet 2A)
3. Research EPA "Superfund" sites in your state. (Assignment Sheet 3A)
4. Analyze current reports concerning water resource management. (Assignment Sheet 4A)

Water Resource Management
Unit 3

Information Sheet

1. **Terms and definitions**

   a. **Aquifer**—Sand, gravel, or rock formation found below the earth's surface which is saturated with water

   b. **Ground water**—Water found below the earth's surface

   c. **Ground water recharge**—Water which seeps through the earth's surface and into ground water aquifers

   d. **Hazardous/toxic waste**—Waste that poses a serious threat to human health, even at low concentrations

   e. **Hazardous waste site**—A location where hazardous waste poses a potential threat to the environment

   f. **Heavy metals**—Metallic elements with high molecular weights; generally toxic to plant and animal life

      Examples: Arsenic, cadmium, chromium, lead, mercury

   g. **Hydrologic cycle**—Continuous circulation of water between the oceans, atmosphere, and the earth's surface

   h. **Industrial waste**—Waste generated by industries

   i. **Municipal waste**—Waste from cities, primarily sewage

   j. **Nonpoint source pollution**—Pollution which enters the environment from a wide area

   k. **Pesticide**—A chemical used to kill or control pests

   l. **Point source pollution**—Pollution which can be traced to a point of discharge

   m. **Septic system**—A waste treatment system used primarily in rural areas or where city sewer lines do not exist

   n. **Surface water**—Water visible on the earth's surface

   o. **Turbidity**—Cloudy appearance of water due to suspended sediment particles

   p. **Water pollution**—Water which is made chemically, biologically, or physically impure or unfit for use

   q. **Watershed**—The total drainage area where water flows to a common point

   r. **Water vapor**—Water which has evaporated and is suspended in the air

Information Sheet

2. History of the importance of water in the United States

a. As the United States was settled, the availability of water was of prime concern because water is critical to the survival of all organisms.

b. Major population centers were located on rivers and lakes.

c. Water wheels were used to harness water's power.

Examples: Grinding corn and wheat and generating electricity

d. Waterways were used for transportation.

e. New industries that formed required large quantities of water.

f. Clean water has always been required for human consumption, agriculture, and fish and wildlife.

g. Water has been used extensively as an economic and recreational resource.

h. Historically, water has always been a vital natural resource.

3. Water distribution

a. Water covers about 71% percent of the earth's surface.

b. 97% of surface water is salt water contained in the oceans.

c. 2% of surface water is contained in polar ice caps and glaciers.

d. 1% of the earth's fresh water is available for human consumption.

e. 97% of fresh water in the United States is contained underground in aquifers.

f. 3% of fresh water in the United States exists in streams and lakes.

g. The volume of ground water in the U.S. that is economically recoverable is equal to 9 times the volume of the Great Lakes.

4. Uses of water

a. Domestic (cooking, drinking, and sanitation in homes)

b. Agricultural (livestock and crop irrigation)

c. Industrial

d. Business

e. Fish and wildlife habitats

f. Recreation

Information Sheet

5. Hydrologic (water) cycle

a. Water exists in various forms.

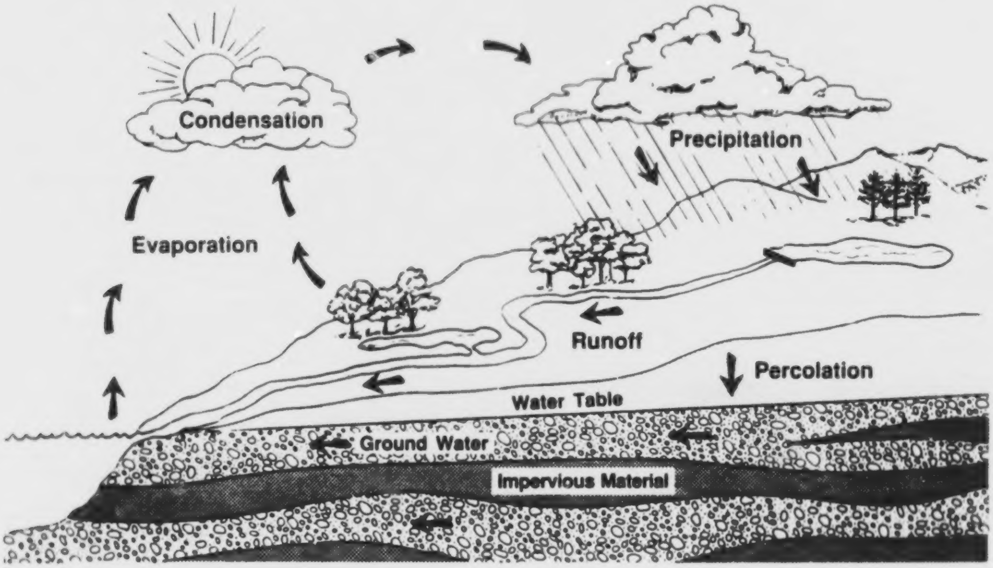
- Liquid—In streams, lakes, rain, and ground water aquifers
- Solid—In polar ice caps, glaciers, snow, hail, sleet, and frozen lakes
- Vapor—Water which has evaporated and is suspended in the atmosphere

b. The total volume of water on earth remains constant.

c. Water continuously moving between the oceans, atmosphere, and surface water bodies constitutes the hydrologic cycle.

- Water from surface water bodies and plants changes from liquid to water vapor (*evaporation*).
- Water vapor changes to liquid as it is cooled in the atmosphere (*condensation*).
- Condensed water falls to the earth as rain or ice (*precipitation*).
- Water forms streams and rivers on the earth's surface (*runoff*), or water infiltrates the soil (*percolation*), supplying moisture for root systems and recharging ground water aquifers.

d. The hydrologic cycle is responsible for restoring water supplies which are lost to evaporation, runoff, and human use.



6. Surface water

a. Surface water is water visible on the earth's surface.

Examples: Streams, farm ponds, lakes, rivers, oceans, wetlands, swamps, and estuaries

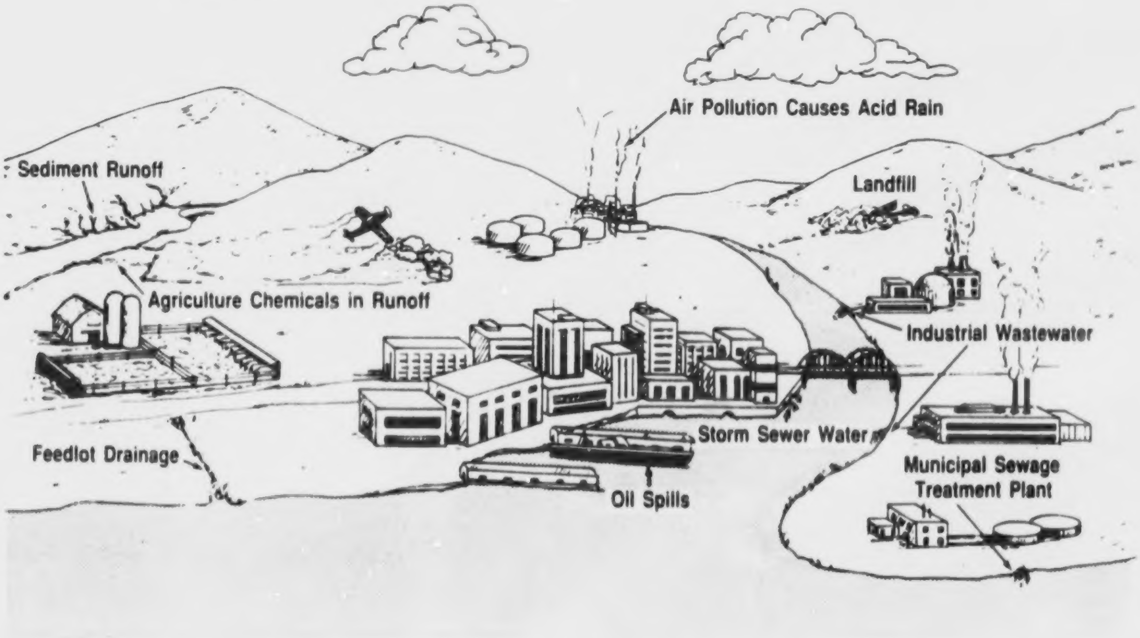
b. Surface water is used extensively without treatment.

c. Surface water must be treated before it can be used for domestic consumption and industrial processes.

d. Drinking water supplied to half of all Americans comes from surface water.

e. Surface waters are easily contaminated by human activities.

Examples:


Air Pollution Causes Acid Rain
Sediment Runoff
Landfill
Agriculture Chemicals in Runoff
Industrial Wastewater
Feedlot Drainage
Storm Sewer Water
Oil Spills
Municipal Sewage Treatment Plant

f. Since quantities of surface waters are limited, their use must be conserved.

7. Ground water

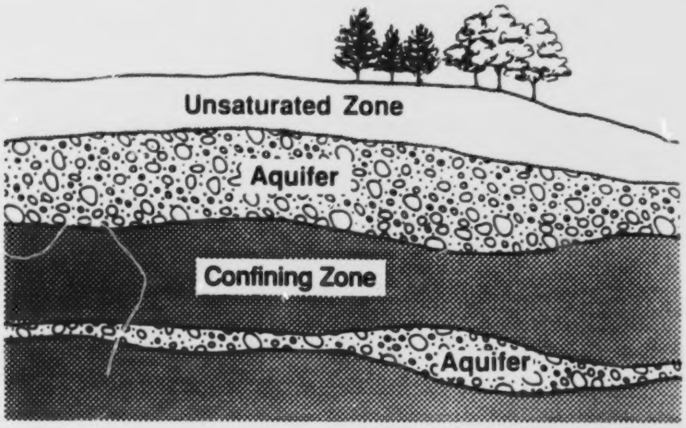
a. Ground water is water which is found below the earth's surface.

b. Ground water aquifers are sand, gravel, and rock formations below the earth's surface which are saturated with water.

- Aquifers are located a few feet to several hundred feet below the earth's surface.

Information Sheet

- Aquifers vary in thickness from a few feet to several hundred feet.



c. Wells are drilled into aquifers to bring water to the surface where it can be used.

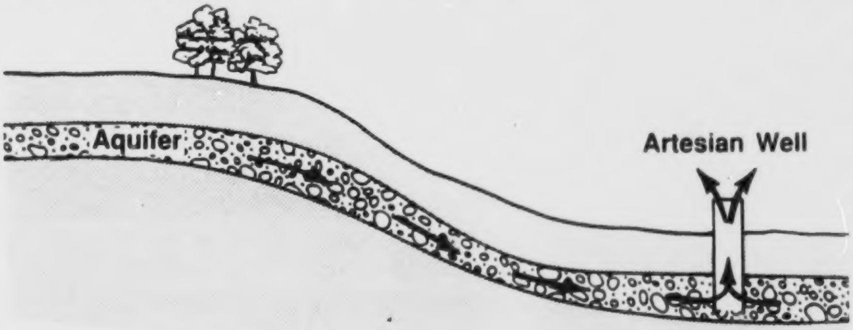
d. Half of all Americans and 95 percent of rural Americans use ground water for drinking water.

e. Contrary to common belief, ground water does not exist as rivers and lakes beneath the earth's surface.

f. The area between the earth's surface and the top of the aquifer is the unsaturated zone.

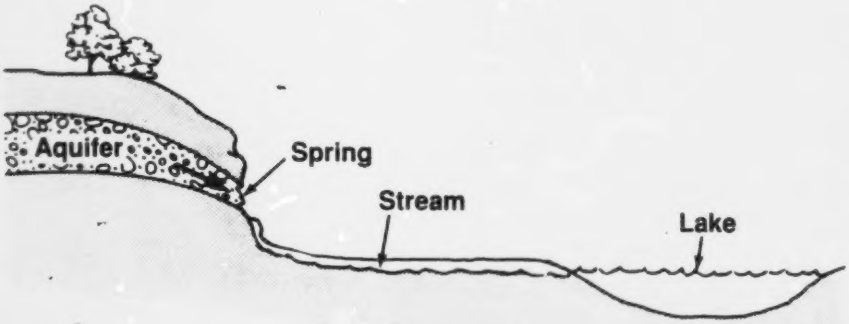
  - The unsaturated zone is composed of various soil types.
  - The unsaturated zone contains moisture but is not saturated.
  - The ground water aquifers are recharged (replenished) by surface water penetrating the unsaturated zone.

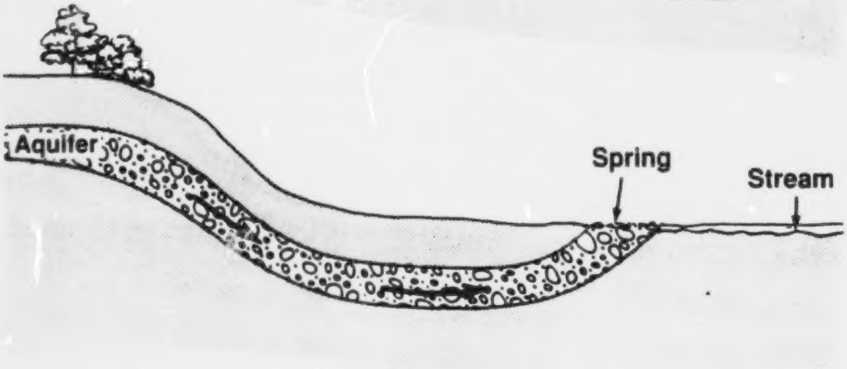
g. Artesian wells are created when aquifer elevations are higher than the top of the well drilled into the aquifer.



Information Sheet

h. Springs exist where aquifer elevations are higher than the spring outlet.



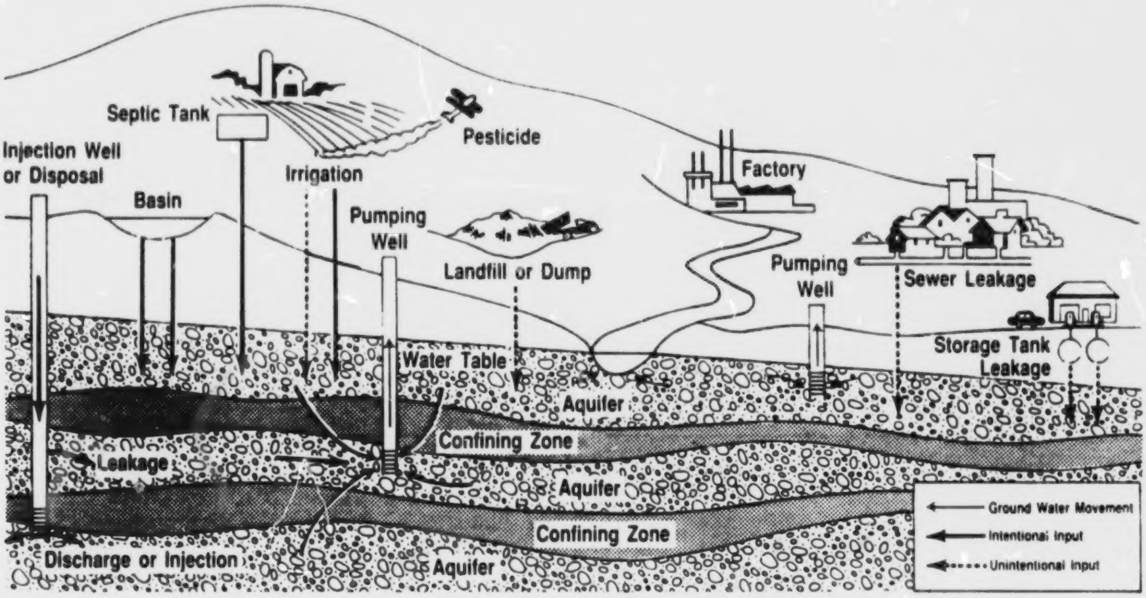


i. Ground water contained in aquifers generally moves very slowly from a few inches to a few feet per day.

Information Sheet

j. Ground water can be easily contaminated by human activities.

Examples:



Courtesy of U.S. Environmental Protection Agency

k. Ground water supplies are limited.

- Ground water use must be regulated and conserved.
- Ground water resources must be protected from contamination.

8. Relationship between ground water and surface water

a. Ground water and surface water are intimately related.

b. Changes in surface water quality or quantity can affect ground water quality and quantity.

c. Changes in ground water quality or quantity can affect surface water.

d. Ground water supplies the base flow for all streams and rivers.

e. During periods of high river and stream elevations, surface water can enter ground water formations.

9. Water pollution

a. Water pollution is defined as water which is made chemically, biologically, or physically impure or unfit for use.

b. Historically, water pollution has caused serious epidemics and health problems in the United States.

   Examples: Cholera, typhoid, infectious hepatitis, heavy metal poisoning, dysentery

c. Many municipal water supplies using surface water were often contaminated.

d. Rural water wells were often contaminated by livestock and human waste.

e. Most epidemic sources of biological pollution were identified and eliminated in the mid-1900's.

f. As biological epidemics decreased, instances of chemical pollution of water resources increased.

g. Chemical pollutants are created as by-products of manufacturing, waste from industrial processes, agricultural and lawn chemicals and fertilizers, and domestic waste disposal practices.

h. Pollutant origin can be generally divided into two categories:

   - Point source—Pollution which can be traced to a point of discharge such as a drain pipe from an industry or sewage treatment plant.
   - Nonpoint source—Pollution from a large area such as soil erosion from construction sites, pesticides, fertilizers, and animal waste from agricultural practices, and drainage from mining practices.

10. Comparison of the environment — 1960 and 1995

a. State of the environment — 1960

   - By 1960, surface waters and ground waters were severely polluted.
   - Pollution of water in the Great Lakes had reduced or eliminated major fish species.
     - — Untreated sewage from large population centers entered the lakes.
     - — Industrial waste was released directly into the lakes or tributaries.
   - Coastal waters were placed off-limits to fishing.
     - — Pollutants from industry, refineries, and agriculture had contaminated the waters and bottom sediment in many areas.
     - — Municipal waste from sewage treatment plants in many areas contained viruses and bacteria which entered the food chain.
     - — Fish and shellfish were unfit for human consumption in many areas.
   - Streams and major rivers were polluted by raw sewage and untreated industrial waste.

Information Sheet

- Sediments entering streams increased turbidity and covered spawning beds with silt, critically reducing fish numbers and species.
  - Lumber companies removed forests next to streams promoting erosion.
  - Mining companies removed surface vegetation and abandoned surface mines creating erosion avenues.
  - Construction of roads, businesses, and residential areas created areas of soil instability.
- Wetlands, which provide a diverse and prolific ecosystem, were destroyed.
  - By 1960, more than 50% of the wetlands in the U.S. had been converted to other uses. Wetlands were drained and converted to agricultural, industrial, or residential areas.
  - By 1960, the rate of wetland loss was 500,000 acres annually.
- Ground water pollution had been detected in every state. Contamination sources included:
  - Nitrates and pesticides from agricultural areas
  - Septic systems
  - Contaminated surface impoundments
  - Leaking underground and surface storage tanks
  - Hazardous waste disposal sites

b. State of the environment — 1995

- The Environmental Protection Agency, along with other federal agencies, state environmental agencies, environmental groups, and concerned citizens, have made significant progress in restoring water quality.
- Waste discharges from industry are regulated and enforced.
- Municipal sewage treatment plants no longer release untreated waste to the environment.
- Dumping of waste in the ocean is regulated.
- Pesticides are now classified and their use is regulated.
- Safe limits on chemicals in drinking water have been set.
- Transport of hazardous chemicals is regulated.
- Storage and disposal of hazardous waste is regulated.
- Funds have been provided for the cleanup of existing hazardous waste sites.
- Sediment from mining operations and lumber mills are monitored and controlled.
- By 1994 wetland loss had been reduced to less than one tenth of its 1960 annual rate through better protection.

Information Sheet

- Ground water resources are now better protected from sources of pollution.

11. **Hazardous/toxic waste**

a. Hazardous or toxic waste is waste that poses a serious threat to human health, even at extremely low concentrations.

b. Improper hazardous waste disposal is a serious threat to water resources.

c. Hazardous waste is generated by:

- Petroleum and petrochemical plants
- Fertilizer producers
- Metal refineries
- Electroplating industries
- Mining industries
- Plastics manufacturers
- Pharmaceutical companies
- Nuclear weapons systems and power plants

d. Until 1975, open dumps were used to dispose of most hazardous waste.

e. The main objective of the Resource Conservation and Recovery Act of 1976 was to regulate the disposal of hazardous waste.

f. Potential sources of water resource contamination include:

- Hazardous waste sites
- Surface pits used for waste disposal
- Hazardous waste land disposal facilities
- Municipal landfills
- Underground storage tanks (hundreds of thousands are estimated to be leaking.)
- Agricultural pesticides and fertilizers

g. Major environmental concerns are for man-made chemicals found in plastics, solvents, pesticides, paints, dyes, varnishes, and ink.

h. Health problems associated with hazardous waste contamination include cancer, brain and nerve damage, birth defects, and miscarriages.

Note: One of the greatest concerns about toxic chemicals is that they stay in the body for extended periods.

Information Sheet

12. Federal legislation for environmental protection of water resources

1970	National Environmental Policy Act	Requires environmental impact statements for all projects affecting the environment
1972	Clean Water Act	Regulates discharges from industry and sewage treatment plants
1972	Marine Protection Research and Sanctuaries Act	Regulates ocean dumping
1972	Ports and Waterways Safety Act	Regulates oil transport
1972	Insecticide, Fungicide, and Rodenticide Act	Classifies pesticides and regulates their use
1974	Safe Drinking Water Act	Sets safe limits on chemicals in drinking water
1974	Hazardous Materials Transportation Act	Regulates transport of hazardous materials
1976	Resource Conservation and Recovery Act	Regulates the treatment, storage, and disposal of hazardous waste
1976	Toxic Substances Control Act	Regulates use of dangerous chemical substances
1980	Comprehensive Response Liability Act ("Superfund")	Provides funds for cleanup of toxic waste dump sites that endanger the public
1987	Water Quality Act	Continues support for sewage treatment plants, initiates new programs to control nonpoint pollution sources, and imposes tighter controls on toxic pollutants

Note: Various state environmental agencies have passed additional legislation to control specific environmental problems in their area.

13. Watersheds

a. Watershed is the total drainage area where water flows to a common point such as a river or lake.

Note: Watersheds are also often called basins or drainage areas.

b. Watersheds vary in size.

- Small watersheds may drain only a few acres before the water is contained in a farm pond or lake.

- Large watersheds may cover millions of acres and drain water from several states.

Example: Watershed

c. Water collected in watersheds is carried away by streams or rivers or is collected behind dams for various uses.

d. Rainwater or water collected in watersheds may also seep into aquifers.

e. Land areas where surface water enters aquifers are called ground water recharge areas.

f. Water pollution is generally caused by human activities on land within the watershed.

Examples: Industrial waste; agricultural chemicals (pesticides, fertilizers); sediment from construction, farmlands, and mining activities; acid rain from fossil fuel combustion; solid waste disposal sites; and municipal sewage treatment plants

14. Water measurements

Note: It is necessary to use abbreviations and conversion factors when determining water volume, water flow, and water quality.

a. Water volume is measured in:

- Milliliter (ml) = 1/1000 of a liter
- Liter (l) = 1000 ml
- Gallon (gal)
- Cubic feet (cu.ft.) = 7.48 gal

Information Sheet

- Acre foot (for lake water volumes) — 1 acre of water, 1 foot deep = 326,000 gal

b. Water flow is measured in:

- Gallons per minute (GPM) — This is usually how water well flow is measured.
- Cubic feet per second (cu.ft./sec) — This is usually how stream and river flow is measured.

c. Water quality is measured in:

- Parts per million (PPM) — 1 part contaminant per 1 million parts water
- Parts per billion (PPB) — 1 part contaminant per 1 billion parts water
- Milligram per liter (mg/l) = 1/1000 of a gram in 1 liter of water

Note: Milligram per liter and parts per million are equal. Parts per million is more commonly used.

15. Career opportunities in water resource management

a. Hydrologist

b. Chemist

c. Geohydrologist

d. Soil scientist

e. Environmental scientist

f. Biologist

g. Chemical engineer

h. Sanitary engineer

i. Agricultural engineer

j. Chemical, physical, and biological technician

Note: Salaries of individual careers are dependent upon level of education and experience.

Water Resource Management
Unit 3

Assignment Sheet 1—Survey Your Area to Identify Water Pollution Sources

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
• Possible sources are identified for area	______
• Explanation of problem is logical	______
• Assignment was completed on time	______
• Assignment is neat and legible	______
• Worked cooperatively with others to reach a common goal	______

Introduction: As you learned in Objective 12, federal and state legislation exists to protect our water resources. Federal agencies, state environmental agencies, environmental groups, and concerned citizens have made significant progress in restoring water quality.

This assignment will provide you with an opportunity to learn about possible or real sources of water pollution in or around your community that may be causing environmental problems.

Directions: Work in a team of 3 or 4, as assigned, to survey possible sources of water pollution in your area. Make a list of these potential sources and explain whether or not each source is causing environmental problems.

1. Potential Source of Pollution: ______________________________

   ____

   Explanation: ______________________________

   ____

   ____

2. Potential Source of Pollution: ______________________________

   ____

   Explanation: ______________________________

   ____

   ____

Assignment Sheet 1

3. Potential Source of Pollution: ______________________________

____

Explanation: ______________________________

____

____

4. Potential Source of Pollution: ______________________________

____

Explanation: ______________________________

____

____

5. Potential Source of Pollution: ______________________________

____

Explanation: ______________________________

____

____

Information Sheet

d. Provide diversions to channel excess runoff.

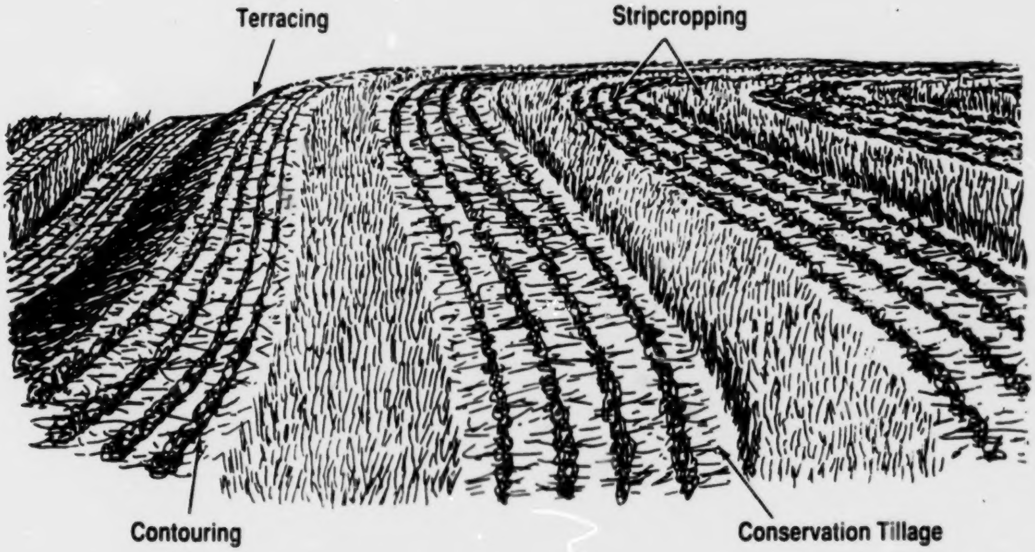
Note: Diversions should be grassed to prevent erosion within diversion channel.

e. Farm on the contour rather than straight-row up and down hills.

f. Terrace to control and manage water runoff.

g. Use contour stripcropping.

h. Use rotation cropping.



i Practice conservation tillage, which leaves a minimum of 30 percent of the previous crop's residue on the soil surface after planting.

Note: This can reduce erosion 50-90% compared with conventional tillage because the soil is not left bare. Crop residue is also beneficial to wildlife and moisture retention.

j. Use tile drainage to remove excess underground water.

k. Use grassed waterways to channel excess runoff.

l. Mulch to hold soil in place.

m. Prevent overgrazing of pastures and rangelands through proper grazing management.

n. Use field borders of perennial vegetation to protect field edges.

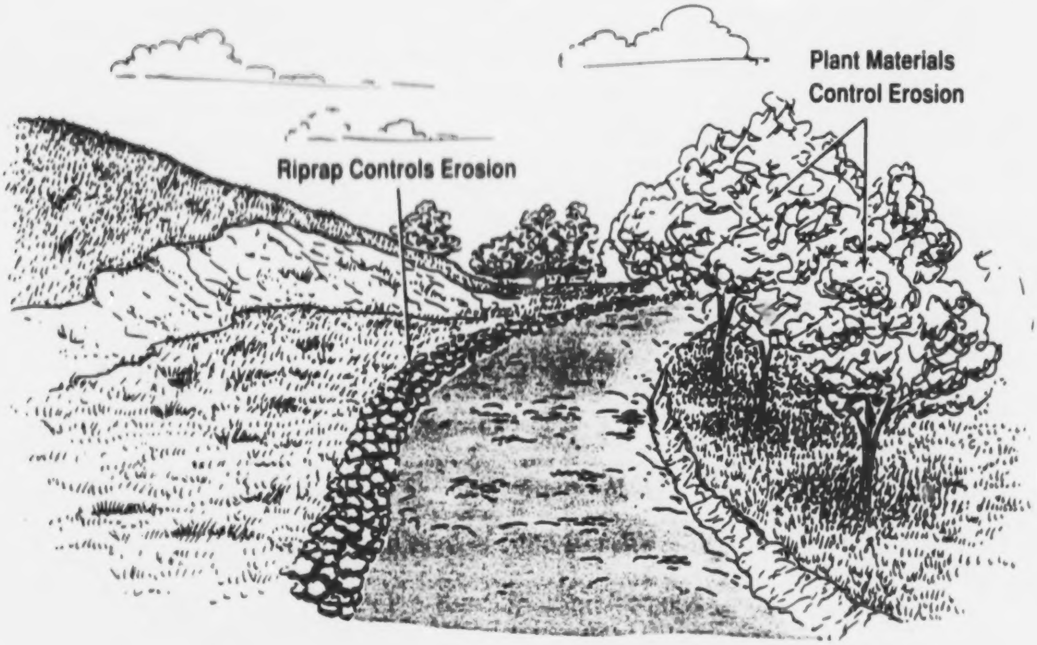
Information Sheet

20. Methods of controlling urban erosion

a. Plant trees.

b. Plant grass and ground covers.

c. Place rock materials (rip-rapping) along riverbank to secure it.



d. Leave vegetation on the soil as long as possible.

e. Disturb only the minimum of a construction area.

f. Cover bare spots with annual grasses, ground covers, sod, and mulch.

Note: Bare soil is very susceptible to erosion.

g. Use erosion blankets or netting during construction or while waiting for grass seed to sprout.

h. Protect slope from failure using jute matting, wooden strips placed across the slope, chemical-binding materials, grass, ground cover, or retaining walls.

i. Use stormwater diversions, berms, waterways, and sediment basins to channel or slow down runoff.

j. Base all building plans on scientific soil surveys.

Information Sheet

21. Stewards of the soil

a. Private landowners

b. Research and education groups

- Land-grant colleges
  - Cooperative Extension Services (state and county)
  - Agricultural experiment stations
- High school agricultural education programs
- Youth organizations — 4-H, FFA

c. Government agencies

- Natural Resources Conservation Service (formerly Soil Conservation Service)
- Forest Service
- Bureau of Land Management
- Bureau of Indian Affairs
- Corps of Engineers
- State and district soil and water conservation offices

22. Conservation Provisions of the historic 1985 Farm Bill

Note: These provisions reflect the goals of the U.S. Department of Agriculture to protect highly erodible lands and wetlands from use as farmland.

a. Conservation Reserve—Offers producers financial help in retiring highly erodible cropland

b. Conservation Compliance (Effective January 1, 1990)—Required farmers to develop and begin actively applying an approved conservation plan for highly erodible cropland

Note: Conservation plans were to be fully implemented by January 1, 1995.

c. Swampbuster—Discourages farmers from converting wetlands to croplands (may lose USDA program benefits)

d. Sodbuster—Discourages farmers from planting on new highly erodible land without a conservation plan (may lose USDA program benefits)

23. Parts of a conservation plan

a. Soil map

b. Land use

c. Soil type and symbols

d. Acres

e. Capability class

f. Slope

g. Planned conservation treatment

24. Reclamation of mined lands

a. Many mineral resources are obtained by surface mining.

Examples: Sand, gravel, stone, iron ore, coal, copper, uranium, phosphate, aluminum ore (bauxite), and gold.

b. Surface mining can be harmful to land.

- Earth is left barren which encourages erosion.
- Rivers and streams become choked with sediment.
- Water that drains through the mines becomes polluted with chemicals.

c. Because of erosion problems, surface strip-mines are required to have a reclamation plan.

d. Reclamation activities

- Earth-moving equipment fills the mined area with rock debris.
- The land is shaped until it resembles the original contour.
- Topsoil is spread over the area.
- Trees, shrubs, and a mixture of grass suitable for the region are planted.

25. Career opportunities in land management

a. Soil conservationist

b. Soil conservation technician

c. Soil scientist

Information Sheet

d. Soil engineer

e. Range specialist (Extension Service, or private/public agencies)

f. Range scientist

g. Wildlife conservationist

h. Ranch manager

i. Farmer

Land Management
Unit 4

Assignment Sheet 1—Read a Soil Test Report

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Directions have been followed	_____
• Answers are correct	_____
• Assignment was completed on time	_____

Directions: Using the soil test report on the following page or one provided by your instructor, answer the questions below.

1. What is the field designation number? ______________________________

2. What is the laboratory number? ______________________________

3. Soil test results:

   a. Pounds of nitrogen — ______________________________

   b. Percent of organic matter — ______________________________

   c. Pounds of phosphorus — ______________________________

   d. Pounds of potassium — ______________________________

   e. pH — ______________________________

   f. Texture — ______________________________

4. Interpretation of test results:

   a. What is the level of nitrogen? ______________________________

   b. What is the level of phosphorus? ______________________________

   c. What is the level of potassium? ______________________________

   d. What is the level of organic matter? ______________________________

Assignment Sheet 1

SOIL TEST REPORT

SOUTH DAKOTA STATE UNIVERSITY • SOIL TESTING LAB • 07 AG. HALL • BROOKINGS, SD 57007

TO—

HURON FFA-VOC. SCHOOL
18TH & ARIZONA S.W.
HURON SD 57350

County: BEADLE
Laboratory No.: 79164
Date Received: 03-27-95
Date Reported: 3-27-95
Record Number: 1058

INTERPRETATION OF SOIL TEST RESULTS

	Alkaline	Satisfactory	HIGH
	Satisfactory	Possible Problem	MEDIUM
	Acid	Poor	LOW

SOIL TEST RESULTS

Field Number	Soil Texture	Soil pH	Soluble Salts mmho/cm	Sodium me/1	Organic Matter %	Nitrogen NO_3-N Top lb/A	Nitrogen NO_3-N Total lb/A	Phosphorus P lb/A	Potassium K lb/A	Sulfer SO_4-S Top lb/A	Sulfer SO_4-S Total lb/A	Zinc ppm	Iron ppm	Manganese ppm	Copper ppm	Calcium ppm	Magnesium ppm
1	FINE	7.6	0.4		2.4	13	44	8	730								

RECOMMENDATIONS

In 1995 for 50 BU/A OATS	N lb/A	P_2O_5 lb/A	K_2O lb/A	S lb/A	Zn lb/A	Fe lb/A	Mn lb/A	Cu lb/A	Ca lb/A	Mg lb/A
1st choice	21	26	0							
2nd choice										—

— The P205 recommendation can be reduced by one-third if applying as a starter.

For additional information contact your County Extension Agent:

These statements are for the first crop choice

HURON SD 57350

Land Management
Unit 4

Assignment Sheet 2—Complete a Land Use Planning Summary

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	______
• Calculations are correct	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Directions: Using the information provided, complete the Land Use Planning Summary on the next page or one provided by your instructor.

1. The 37 acres of field number one are in hayland.
2. The 16 acres of field number two are in hayland.
3. The planned practice for field number two is to seed in 1996.
4. The 2 acres of field number three are for the farmstead.
5. The 47 acres of field number four are for wildlife.
6. The planned practice for field number four is brush control in 1997.
7. The 138 acres of field number five are for rangeland.
8. The planned practice for field number five is to cross fence in 1998.
9. The 45 acres of field number six are for pastureland.
10. The planned practice for field number six is to seed in 1996.
11. Calculate the total acres and place in appropriate places at top and bottom of form.

Assignment Sheet 2

USDA-SCS

LAND USE PLANNING SUMMARY

Cooperator ______________________ Acres ____________ CD ______________

Assisted by ______________________________________ Date ______________

Field	Acres	Land Use					Planned Practices
		Hay Land	Wild Life	Farm Stead	Range Land	Pasture Land	
Total							

Land Management
Unit 4

Assignment Sheet 3—Read a Soil Survey Map

Name ________________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	_____
• Answers are correct	_____
• Assignment was completed on time	_____

Directions: Using the soil survey map on the next page, answer the following questions.

1. List the different soil type map symbols.

    a. ____________

    b. ____________

    c. ____________

    d. ____________

2. In what corner of the map is the large residential area? ____________________

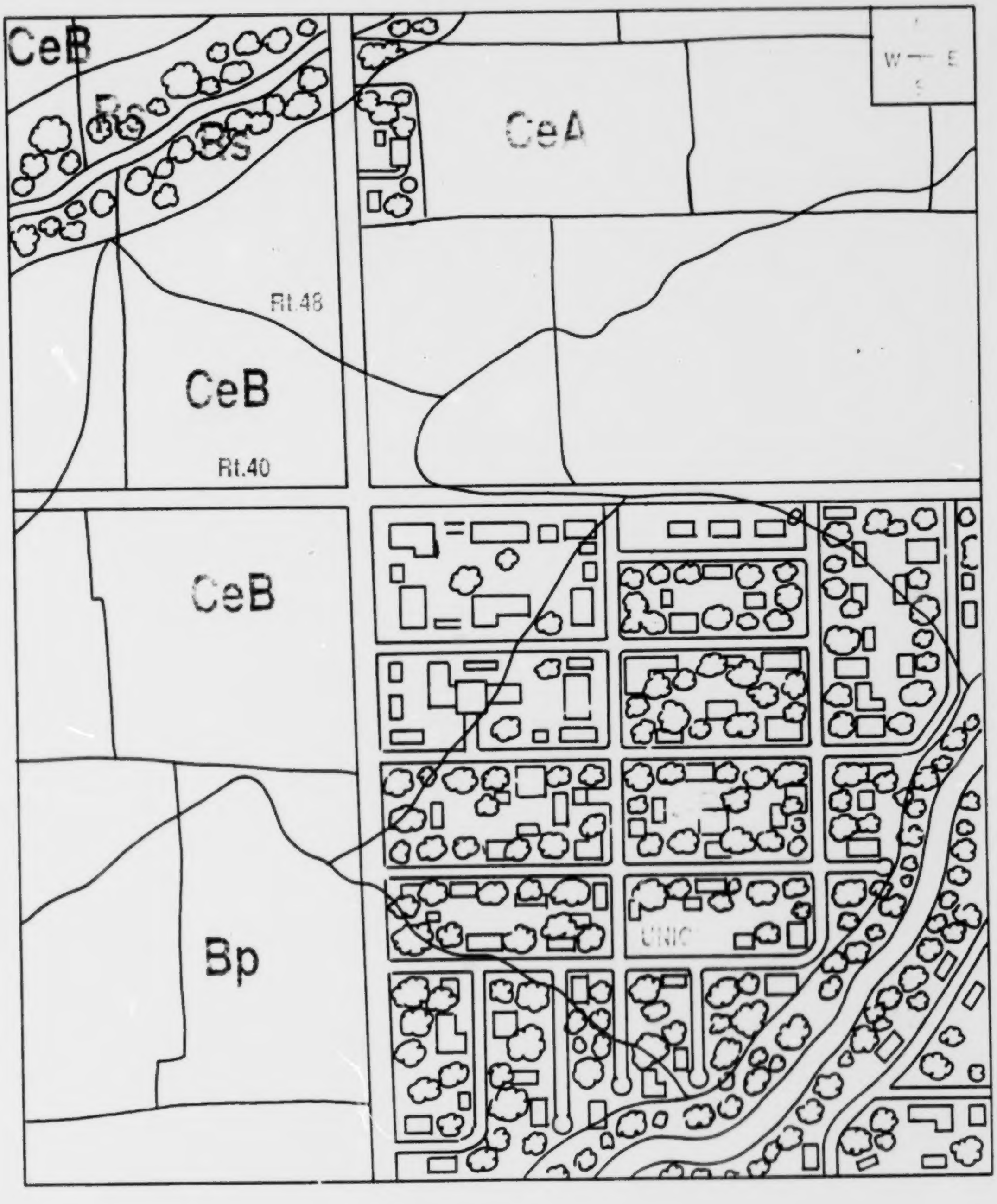
3. What soil type is found in the residential area? ____________________

4. What soil type is located in areas of streams and possible lowlands? ____________________

5. What soil type is located east of the farmstead? ____________________

Assignment Sheet 3

Soil Survey Map



Land Management
Unit 4

Assignment Sheet 4—Read a Conservation Plan

Name ______________________________ Overall Rating ______________

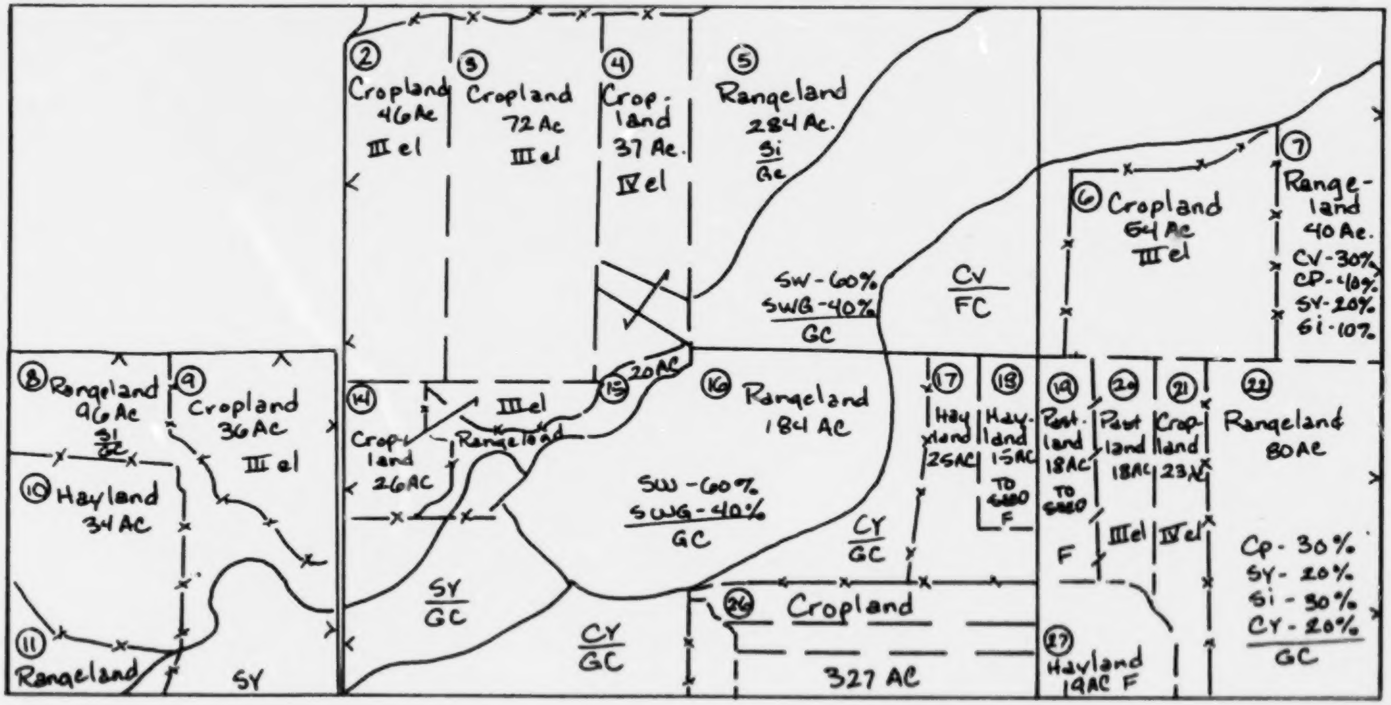
Evaluation criteria	**Rating**
• Directions have been followed	______
• Answers are correct	______
• Assignment was completed on time	______

Directions: Using the conservation plan map provided on the next page, answer the following questions.

1. What is the county? ______________________________
2. Who was the USDA Natural Resources Conservation Service person who assisted in the development of this plan? ______________________________
3. How many acres are in field number 2? ______________________________
4. What is field number 5 used for? ______________________________
5. What is the land capability class of field number 9? ______________________________
6. What is the conservation practice for field number 19? ______________________________
7. What is the field number 6 used for? ______________________________
8. Who owns this land? ______________________________
9. How many acres are in field number 17? ______________________________
10. What is the land capability class of field number 4? ______________________________

CONSERVATION PLAN MAP *(only part of map shown)*

Owner Darold Hehn Operator same Date 6/95
County/Parish Tillman State SD Appx. acres 2320 Appx. scale 1"=1320'
Cooperating with Tillman Conservation District Assisted by Mary Kellum USDA-NRCS



Assignment Sheet 4

Land Management
Unit 4

Job Sheet 1—Take a Lawn and Garden Soil Sample

Name ______________________________ Attempt Number ____________

Date ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Demonstrated proper use of equipment	______
• Properly chose sampling spots	______
• Properly mixed samples	______
• Correctly filled out soil sample sheet	______

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Equipment and materials

- Soil tube, soil auger, garden trowel, or spade
- Plastic bucket
- Soil sampling information sheet provided by instructor

B. Procedure

☐ 1. Scrape away any surface mat of grass or litter.

☐ 2. Sample the lawn and garden areas to the depth indicated below.

a. Existing grass = 0-3 inches
b. For new grass = 0-6 inches
c. Gardens = 0-6 inches
d. Trees and shrubs = 0-12 inches

Note: Avoid taking samples in areas like borders, low spots, near trees, or near building.

☐ 3. Place the soil in a clean bucket or pan.

☐ 4. Sample in at least 10 spots within the area.

☐ 5. Mix samples of soil well to make a composite sample.

☐ 6. If samples are wet, air dry before placing in soil sample container.

Job Sheet 1

☐ 7. Fill out the soil sample information sheet provided by your instructor. An example is shown on the next page.

☐ 8. Enclose the information sheet and the soil sample in a sturdy carton.

☐ 9. Send the package to the soil testing laboratory.

Evaluator's comments: ______________________________

____

____

LAWN AND GARDEN SOIL SAMPLING INFORMATION SHEET

PRESS HARD! You are making three copies.
Read the instructions on the back. Fill
in as completely as you can.

Soil Testing Laboratory, South Dakota State University
Brookings, SD 57007

Date received ____________

Date ____________ **Name** ____________ **Address** ____________ **Zip** ____________

Extra copy sent to: Name ____________ **Address** ____________ **Zip** ____________

Soil Sample						**Tests Desired (✓)**								
No on bag	Lab number (do not write below, for lab use only)	Depth of sampling	County	**Type of sample taken** (new lawn, established lawn, vegetable garden, flower garden, fruit trees, shrubs, golf tees, greens, fairways, etc.)	Check if area is watered regularly	Regular Tests	Zinc	Iron	Manganese	Copper	Calcium Magnesium	Sulfur	Lime need	Boron
					Charges: per sample	$7.00	3.00	3.00	3.00	3.00	6.00	7.00	6.00	7.00

*Includes nitrate-nitrogen, organic matter, phosphorus, potassium, pH, soluble salts, texture class. For the vast majority of South Dakota soils, the regular series of tests will be sufficient.

Indicate special problems or comments. Note if shading, weeds, insects, diseases, water, etc., are a problem. List vegetables, grasses, fruits, flowers, trees, and shrubs of special interest.

____

____

____

____

____

Sketch area(s) sampled for your information.

Job Sheet 1

PC 063

Sampling Instructions on Back
Send all three copies with sample. The original will be returned to you.
Do Not Detach

NR-125

Land Management
Unit 4

Job Sheet 2—Perform a Soil Test to Determine Organic Matter

Name ______________________ Attempt Number ______________

Date ______________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Properly mixed samples	____
• Correctly observed results of test	____
• Practiced safety rules throughout procedure	____

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Equipment and materials

- Test tube and stopper
- Sodium hydroxide
- Water
- Test tube rack
- Spoon
- Eye dropper
- Redco Science Kit "What's In a Soil" provided by instructor
- Soil for testing

B. Procedure

☐ 1. Add one level spoonful of soil to test tube.

☐ 2. Add two droppersful of sodium hydroxide to the tube.

☐ 3. Add two droppersful of water to the tube.

☐ 4. Shake the tube well and place it in a test tube rack.

☐ 5. Let tube set for a day.

Job Sheet 2

☐ 6. Observe the color of liquid and indicate (✓) your results below.

- Pale yellow color—Indicates a small amount of organic material
- Orange to brown color—Indicates presence of a large amount of organic materials

Evaluator's comments: ______________________________

____

____

Water Resource Management
Unit 3

Assignment Sheet 2—Evaluate Your Source of Drinking Water

Name ______________________ Overall Rating __________

Evaluation criteria	Rating
• Information is accurate	____
• Potential sources of contamination are realistic	____
• Explanation of safety of drinking water is logical	____
• Assignment was completed on time	____
• Assignment is neat and legible	____

Introduction: In the United States, people take it for granted that when they want a glass of water to drink all they have to do is turn on the faucet. This is not true in many parts of the world because proper treatment facilities are not available to purify water from rivers and streams. And, there are no laws to control waste disposal and to protect the water resources. As a result, diseases such as cholera and dysentery are common in undeveloped countries, and the only safe drinking water comes from bottled water.

In this assignment you will learn about your source of drinking water and evaluate whether your drinking water at home and school is safe.

Directions: Answer the following questions, based on class discussions with a representative of the municipal or rural water distribution system.

1. Where does your drinking water come from, both at home and at school? ______________

   ____

2. Is your drinking water treated? ______________________________

3. If your drinking water is treated, how is it treated? ______________________

   ____

4. How often is your drinking water tested? ______________________________

5. What did the last test of your drinking water show? ______________________

   ____

Assignment Sheet 2

6. What are the potential sources of contamination to your drinking water? ______________________

____

____

7. In your own opinion, is the water you drink safe? Explain. ______________________

____

____

Water Resource Management
Unit 3

Assignment Sheet 3—Calculate Water Measurements

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Calculations are accurate	______
• Assignment was completed on time	______

Introduction: If you ever watch the weather on television, you may remember that part of the weather report includes the total amount of rainfall for the current month, and that number is often compared to the average rainfall per month for that area. This information gives farmers and gardeners an idea as to water distribution per acre from rainfall.

In this assignment you will determine the gallons per acre based on annual rainfall in your area.

Example:
1) If annual rainfall in the area is 18″,
2) 18″ ÷ 12 = 1.5 acre-feet
3) 1.5 × 326,000 gallons = 489,000 gallons per acre

Directions: Calculate water measurements using the following procedure.

1. Determine the annual rainfall in your area.
2. Divide that number by 12 to determine acre-feet.

   Note: This will give you the number of feet of rain (acre feet) that falls in your area annually.
3. Multiply the acre feet by 326,000 gallons to determine the gallons per acre.

   Note: This is the number of gallons in one acre foot.

Water Resource Management
Unit 3

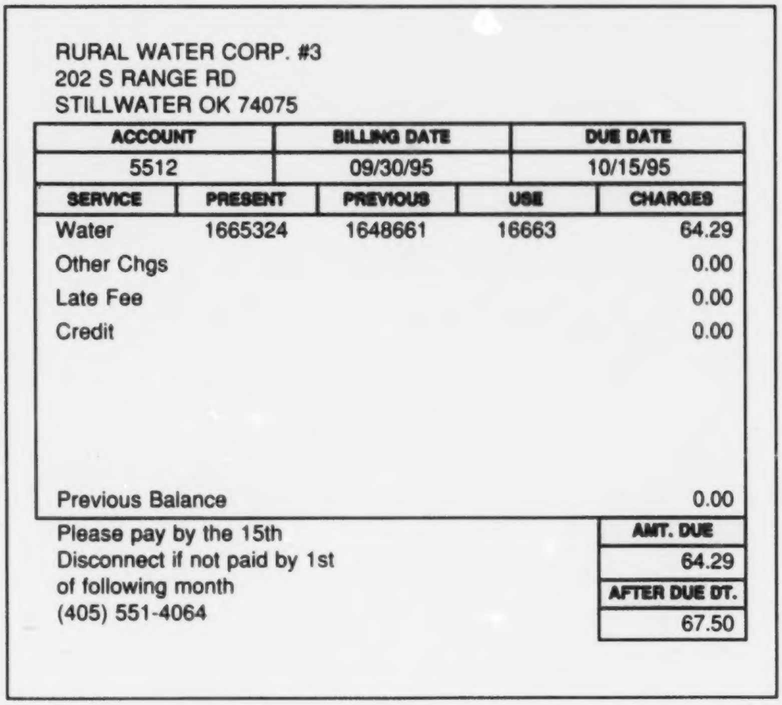
Assignment Sheet 4—Calculate the Cost of Water

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Answers are correct	______
• Assignment was completed on time	______

Introduction: Where municipal and rural water systems provide safe, clean drinking water at the turn of a faucet, most consumers pay little thought to the cost of water. Still, purchasing water, filtering and treating it to federal standards, and maintaining its distribution system involves expenses which must be borne by water consumers. This exercise will give you some idea of the cost of water provided by a rural water system to a household of four.

Directions: Read and answer the following questions based on the accompanying water bill.



RURAL WATER CORP. #3
202 S RANGE RD
STILLWATER OK 74075

ACCOUNT	BILLING DATE	DUE DATE
5512	09/30/95	10/15/95

SERVICE	PRESENT	PREVIOUS	USE	CHARGES
Water	1665324	1648661	16663	64.29
Other Chgs				0.00
Late Fee				0.00
Credit				0.00
Previous Balance				0.00

Please pay by the 15th
Disconnect if not paid by 1st
of following month
(405) 551-4064

AMT. DUE
64.29
AFTER DUE DT.
67.50

Assignment Sheet 4

1. What is the present meter reading reflected on this bill?

____

2. What is the previous meter reading reflected on this bill?

____

3. Using the present meter reading and the previous meter reading, is the "use" figure reflected on this bill correct?

____

4. Because a water meter measures actual gallons passing through it, use the "use" figure and the total charges for this month's bill to determine how much per gallon this rural water system customer is charged.

____

5. Using the answer you calculated in question 4, select and circle the answer from the following choices that most closely estimates the number of gallons one penny would buy from this rural water system.

   a. 10 gallons
   b. 100 gallons
   c. 33 gallons
   d. 2.5 gallons

6. Using a water bill from a local water distribution system in your area, determine how much a customer is charged per gallon of water.

____

Land Management
Unit 4

Objective Sheet

Unit Objective

After completing this unit, the student should be able to perform and interpret a soil test and read a soil survey map and conservation plan. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to land management with their definitions.
2. Complete statements concerning how soils are formed.
3. Match types of rocks with their definitions.
4. List weathering factors.
5. Match types of soils with the ways they are deposited.
6. Distinguish among the major soil texture classes.
7. Select from a list the composition of an average soil.
8. Select from a list the functions of organic matter.
9. Identify the three horizons of a soil profile.
10. Match land capability classes with their definitions.
11. Select true statements concerning soil testing.
12. Distinguish between major and minor plant nutrients.
13. Identify nutrients in a fertilizer analysis.
14. Select true statements concerning soil survey reports.
15. List the two types of erosion.
16. List causes of erosion.
17. Complete statements concerning the effects of erosion.
18. Select from a list the contributors to erosion pollution.

Objective Sheet

19. List methods of controlling erosion on the farm.
20. Select from a list methods of controlling urban erosion.
21. List stewards of the soil.
22. Match the Conservation Provisions of the historic 1985 Farm Bill with their descriptions.
23. List parts of a conservation plan.
24. Select true statements concerning reclamation of mined lands.
25. List career opportunities in land management.
26. Read a soil test report. (Assignment Sheet 1)
27. Complete a land use planning summary. (Assignment Sheet 2)
28. Read a soil survey map. (Assignment Sheet 3)
29. Read a conservation plan. (Assignment Sheet 4)
30. Take a lawn and garden soil sample. (Job Sheet 1)
31. Perform a soil test to determine organic matter. (Job Sheet 2)
32. Determine percent of soil particles. (Job Sheet 3)

Advanced Applications (Optional)

1. Determine fertilizer composition and rates. (Assignment Sheet 1A)
2. Report on GIS/GPS technology and utilization. (Assignment Sheet 2A)
3. Determine suitability of a site for a septic system. (Job Sheet 1A)

Land Management
Unit 4

Information Sheet

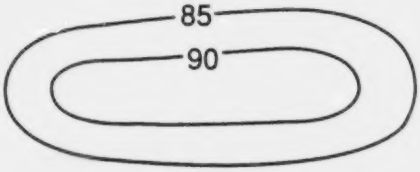
1. **Terms and definitions**

   a. **Bacteria**—Microscopic, single-celled plants active in consuming wastes and building topsoil

   b. **Compaction**—Pressing soil particles closer together which leaves less pore spaces available for air or water in the soil

   c. **Contour**—An imaginary line along the ground connecting all points of the same elevation

   Example:



   Note: Contours denote "fall" or changes in elevation.

   d. **Erosion**—The wearing away of land surface

   e. **Fertilizer**—An organic or inorganic material that is added to the soil to supply elements essential to plant growth

   f. **Flood hazard**—Refers to the likelihood that an area will receive flood damage

   g. **Humus**—Highly decomposed plant and animal residue that is a part of soil

   h. **Inert material**—A clay material used as a filler in fertilizer applications

   i. **Land capability class**—The suitability of land for a specific use without permanent damage

   j. **Land management**—The planning and implementation of practices applied to the land

   k. **Land use planning**—A political process to determine the uses of a given land

   l. **Loam**—A soil material that contains relatively equal amounts of sand, silt, and clay particles

   m. **Mineral**—A naturally-occurring inorganic substance in the soil

   n. **Mulch**—A layer of plant residue on the soil surface

   Note: A mulch can be any material not harmful to plants which helps conserve moisture, moderate soil temperatures, and retard weed growth. Some mulch materials include: plastic film, newspapers, straw, composted garden waste, etc.

o. **Organic material**—Plant and animal matter in various stages of decay

p. **Parent material**—The earth materials from which soil is formed

q. **Percolation**—The downward movement of water into the soil

r. **Permeability**—The ability of the soil to allow air and water to move through it

s. **pH**—A scale which represents alkalinity or acidity

t. **Plant nutrients**—Elements essential for plant growth

Note: The most important plant nutrients are nitrogen, phosphorous, and potassium.

u. **Reclamation**—Transforming barren areas as nearly as possible to their original condition after surface disturbance

v. **Slope**—The angle of the soil surface expressed as a percent of rise and fall

w. **Soil**—The outer portion of the earth's crust that supports plant life

x. **Soil auger**—A tool used to bore into the soil and withdraw a soil sample

y. **Soil horizon**—A layer of soil materials

z. **Soil profile**—Vertical section of a soil horizon

aa. **Soil type**—A soil series based on surface texture

bb. **Soil map**—A map showing the distribution of soil types

cc. **Soil survey**—The systematic examination, description, classification, and mapping of soils in an area

dd. **Texture**—The fineness or coarseness (size) of soil particles

ee. **Topography**—The study of physical features (natural and man-made) on the land's surface

ff. **Weathering**—The actions that break down rock into soil, i.e., freezing/thawing; wind and water erosion; glaciation

gg. **Windbreak**—A living barrier of trees and shrubs designed for protection from wind and/or snow

2. How soils are formed

a. Soil begins as rock.

b. Weathering factors work to break rocks down.

Information Sheet

c. Soil types are based upon the type of rock from which they are made.

d. Rock particles are further broken into various smaller sizes of rocks and minerals.

e. Small plants (lichens and mosses) begin to grow on the rock surfaces.

f. Dead plant materials (organic matter) are mixed with rock fragments.

g. As more organic matter is formed, larger plant forms (ferns, grasses, shrubs) take root.

h. Bacteria and fungi break down the organic matter into simpler nutrients that are released into the soil, further aiding plant growth.

Note: This is a very slow process requiring years.

3. **Types of rocks**

   a. **Igneous**—Formed by hardening of molten volcanic materials

   c. **Metamorphic**—Formed as a result of changes in other rocks under heat and pressure

   b. **Sedimentary**—Formed by a consolidation of particles laid down over the years

4. **Weathering factors**

   a. Temperature changes—Heating and cooling cause rock to crack.

   b. Winds—Sand may be blown against a larger rock, eroding its surface.

   c. Water—Water-soluble minerals are dissolved and eroded particles are carried away.

   d. Chemicals—Chemicals dissolved in the soil water eat away rock surface.

   e. Ice—Expansion of frozen water can cause rocks to break.

   f. Glaciers—Flowing ice can move rocks and grind them into pieces.

5. **Ways soils are deposited**

   a. Glacial soils—Deposited by glaciers

   Example: Rich farmland soils of the Corn Belt

   b. Loess soils—Deposited by wind

   Example: Rich Paloose soils of the Pacific Northwest

   c. Alluvial soils—Deposited by moving fresh water

   Example: Delta regions at the mouth of rivers

Information Sheet

6. Major soil texture classes

a. Sand

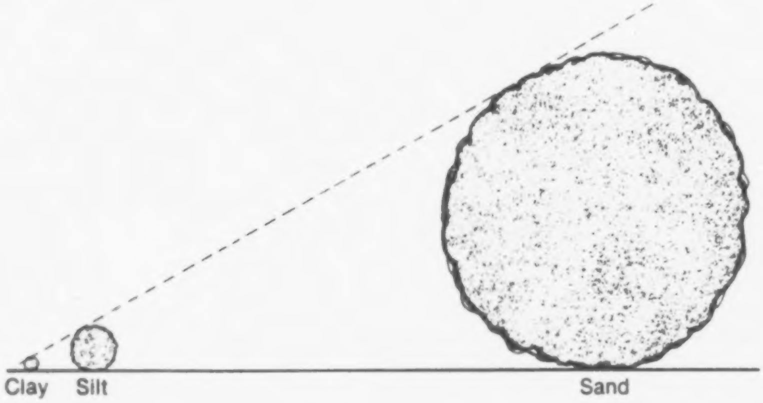
- A coarse-textured soil
- Grains can easily be seen and felt
- When dry, will fall apart; when wet, will form a cast
- Has high permeability rate

b. Silt

- A medium-textured soil
- Feels smooth and talc-like when wet
- Most grains are difficult to see
- Has medium permeability rate

c. Clay

- A fine-textured soil
- When wet, will form an inch-long ribbon when stretched
- Individual grains are impossible to see with an unaided eye
- Has low permeability rate



Courtesy of Oklahoma CIMC

Information Sheet

7. **Composition of an average soil**

   a. Mineral matter — 45%

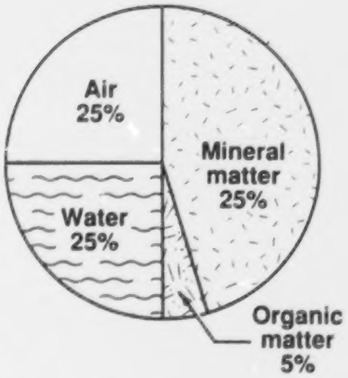
   Examples: Clay, silt, sand, gravel

   b. Water — 25%

   c. Air — 25%

   d. Organic matter — 5%

   Examples: Living and dead organisms



   Note: These figures are for an average soil. Specific soils will vary.

8. **Functions of organic matter**

   a. Serves as a cementing agent for soil particles

   b. Returns plant nutrients to the soil

   c. Stores soil moisture

   d. Provides food for soil microorganisms (bacteria)

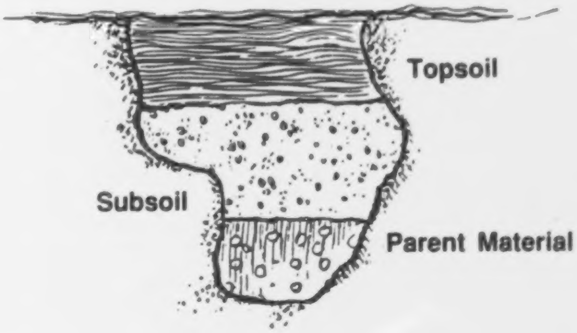
   e. Makes soil more tillable and able to support plant life

9. **Horizons of a soil profile**

   a. Topsoil

   b. Subsoil

   c. Parent material



Courtesy of Oklahoma CIMC

10. **Land capability classes**

   Note: These classes categorize soil according to its productivity.

   a. Class I-IV—Soils that can be used for cultivated crops but require proper land management

b. Class V-VII—Soils unsuited for cultivated crops and restricted largely to grazing, woodland, or wildlife

c. Class VIII—Soils suited only for recreation, wildlife, water supply, or aesthetic purposes

11. **Soil testing**

a. Soils differ in the amount of nutrients they can supply to plants.

b. A soil test will estimate the amount of nutrients a soil can provide to a plant.

c. Adding major plant nutrients based on a soil test can increase yield and will improve quality of the plant.

d. Soil tests can also determine the pH of the soil and the soil texture.

Note: Alkalinity or acidity (pH) of a soil significantly affects how readily available plant nutrients are for plant growth.

12. **Plant nutrients**

a. Major plant nutrients

- Nitrogen
- Phosphorus
- Potassium

b. Minor plant nutrients

Note: These nutrients are needed by the plant in very small quantities but are of major importance nevertheless. Most minor nutrients are available in sufficient quantities in the soil, although a soil analysis may detect deficiencies which need to be supplemented.

- Zinc
- Manganese
- Boron
- Copper
- Iron
- Molybdenum
- Calcium
- Sulfur

Information Sheet

- Chlorine
- Magnesium

13. Nutrients in a fertilizer analysis

Note: Fertilizers are a mix of inert material and a percent of major nutrients. Some fertilizers have minor nutrients added to the mix based on the need.

a. Nitrogen (N)—First nutrient represented in a fertilizer analysis

b. Phosphorus (P)—Second nutrient represented in a fertilizer analysis

c. Potassium (K)—Third and last nutrient represented in a fertilizer analysis

Examples: Fertilizer Analyses

33-0-0		33%N	26-10-3		26%N	5-10-10		5%N
	=	0%P		=	10%P		=	10%P
N P K		0%K	N P K		3%K	N P K		10%K

14. Soil survey reports

a. Contain aerial photograph maps of an entire county and indicate all soil types with soil map symbols or numbers that correspond to a legend of soil types

b. Give descriptions of soils in that county

c. List management information to assist in land use planning

- Agricultural data such as potential crop yield of a given soil type
- Engineering data such as suitability of a soil for roads or other civil structures
- Planning data such as suitability of a soil for homesites

15. Types of erosion

a. Wind

b. Water

Information Sheet

16. **Causes of erosion**

    a. Moving water

    b. Topography including slopes of the land

    c. Lack of vegetation

    d. Dry climate conditions

    e. Wind

    f. Human activities

    Examples: Construction, mining, agriculture, recreation that disturbs or removes vegetation

17. **Effects of erosion**

    a. Reduces fertility of land

    b. Increases sediment in water bodies

    c. Increases water filtration expenses

    d. Destroys spawning beds of game fish

    e. Reduces fish food supply

    f. Fills pools where fish live

    g. Increases the damage caused by floods

18. **Contributors to erosion pollution**

    a. Riverbank erosion

    b. Farming erodible lands

    c. Unprotected construction sites

    d. Industrial and mining activities

19. **Controlling erosion on the farm**

    a. Plant buffer strips of perennial grasses to hold soil particles.

    b. Plant windbreaks to slow wind speeds.

    c. Ridge soil into small furrows to trap soil particles.

Land Management
Unit 4

Job Sheet 3—Determine Percent of Soil Particles

Name ______________________ Attempt Number ____________

Date ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Properly mixed soil sample	______
• Correctly labeled layers	______

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Equipment and materials

- Glass jar with lid
- Soil sample
- Water
- Paper and pencil(s) or markers

B. Procedure

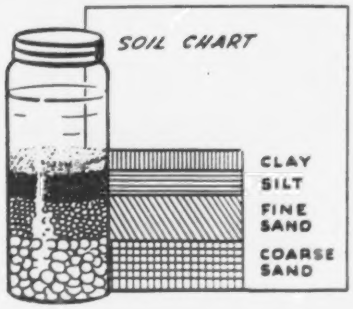
☐ 1. Fill the jar to half full with soil.

☐ 2. Fill the jar to three-fourths full with water.

☐ 3. Shake the mixture vigorously until soil is in suspension.

☐ 4. Allow the mixture to settle and observe the soil separation.

☐ 5. After a twenty-four-hour period of time, place a sheet of paper next to the jar and mark the different soil particle layers.



Courtesy of USDA Natural Resource Conservation Service

Job Sheet 3

☐ 6. Estimate the percent of each soil layer.

______% Clay

______% Silt

______% Fine sand

______% Coarse sand

Evaluator's comments: ____

____

____

Air Resource Management
Unit 5

Objective Sheet

Unit Objective

After completing this unit, the student should be able to describe the environmental effects and health hazards associated with air pollution and discuss global considerations in air resource management. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to air resource management with their definitions.
2. Draw a pie chart depicting the composition and percentages of air components (unpolluted).
3. Match air pollutants with their characteristics and health hazards.
4. Complete statements concerning the environmental effects of air pollution.
5. Select true statements concerning indoor air pollution.
6. Match indoor air pollutants with their characteristics.
7. Select true statements concerning air quality regulations.
8. List methods of controlling motor vehicle emissions.
9. List methods of controlling air pollution from industry and electrical power generating plants.
10. Read a graph on air quality trends in the United States.
11. Discuss global considerations in air resource management.
12. List career opportunities in air resource management.
13. Locate sources of air pollution in your area. (Assignment Sheet 1)
14. Write a report on a global environmental problem related to air quality. (Assignment Sheet 2)
15. Observe particulate matter collected on a petroleum jelly pad. (Assignment Sheet 3)

Objective Sheet

Advanced Applications (Optional)

1. Collect and report results from air monitoring equipment. (Assignment Sheet 1A)
2. Investigate the contribution of methane gas to global warming. (Assignment Sheet 2A)
3. Maintain a weather log for 21 days. (Assignment Sheet 3A)
4. Formulate weather forecasts. (Assignment Sheet 4A)
5. Analyze current reports concerning federal mandates to combat air pollution from auto exhaust. (Assignment Sheet 5A)

Air Resource Management
Unit 5

Information Sheet

1. **Terms and definitions**

   a. **Air**—A mixture of invisbile, odorless, tasteless gases that surround the earth

   b. **Air pollution episode**—Abnormally high concentrations of air pollutants

   Note: This is usually due to low winds and temperature inversions.

   c. **Ambient air**—Any unconfined portion of the atmosphere; the outside air

   d. **Atmosphere**—The mass of air surrounding the earth held by the force of gravity

   e. **Emission**—Pollutant discharged into the air

   f. **Inversion**—An atmospheric condition where a layer of cool air is trapped by an upper layer of warm air

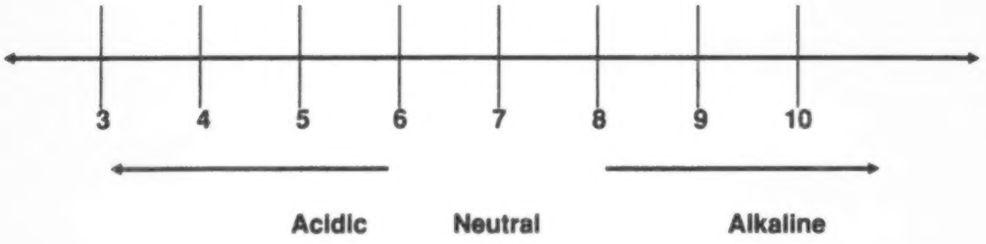
   g. **National ambient air quality standards (NAAQS)**—The level of pollutants in the outside air that by law cannot be exceeded during a specified time in a specified geographical area

   h. **Organic compounds**—Compounds composed of chemicals containing carbon

   Examples: Pesticides, solvents, cleaning compounds, paints, soft drinks

   i. **pH**—A scale which represents alkalinity or acidity

   Note: The pH scale ranges from 0 to 14 with 7 being neutral, below 7 acidic, and above 7 alkaline.



   j. **Pollutant**—Any introduced gas, liquid, or solid that makes a resource unfit for a specific purpose

   k. **Pollution**—The presence of matter or energy whose nature, location, or quantity produces undesirable environmental effects

l. **Population density**—The number of people per unit area

Example: People per square mile

m. **Respiratory system**—Organs such as the throat, lungs, and air channels which supply oxygen to air-breathing vertebrates

n. **Scrubber**—An air pollution control device that uses a liquid spray to remove pollutants from a gas stream (as in a smoke stack); also lowers the temperature of the emission

o. **Stagnation**—Lack of wind in an air mass

Note: This tends to trap and concentrate pollutants.

2. **Composition and percentages of air components (unpolluted)**

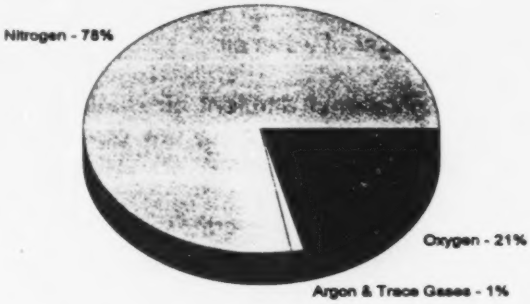
a. Nitrogen 78%

b. Oxygen 21%

c. Argon 0.9%

d. Trace amounts 0.1% of the following gases:

- Carbon dioxide
- Nitrous oxide
- Organic vapors
- Hydrogen
- Methane
- Neon
- Helium
- Xenon
- Krypton



3. **Air pollutants and their characteristics and health hazards**

Air Pollutants	Health Hazards
a. **Particulate matter**	
• Finely divided solid or liquid particles in the air or in an emission such as dust, smoke, and fumes	Contributes to eye and throat irritation, bronchitis, lung damage, and impaired visibility
• Caused by steel mills, power plants, cement plants, grain elevators, dirt roads, fireplaces, all types of burning, agricultural practices, construction, use of diesel engines	

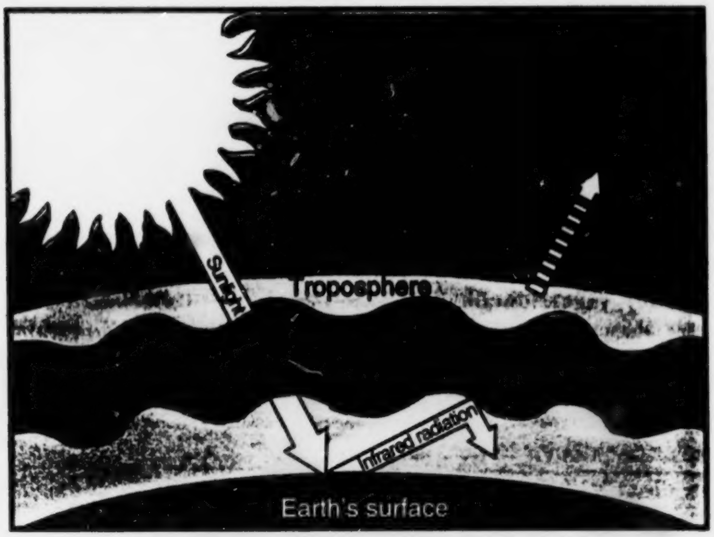
Information Sheet

Air Pollutants	Health Hazards
b. **Ozone** (O_3)	
• A pungent, colorless, toxic gas • Produced when sunlight hits air pollutants such as volatile organic compounds (VOCs) and nitrogen oxides which are released from fossil fuel combustion (primarily vehicles); also, a natural byproduct of lightning • Major component of smog	Serious respiratory problems such as breathing difficulties, asthma, reduced lung function, eye irritation, nasal congestion, and reduced resistance to infection
c. **Carbon monoxide** (CO)	
• A colorless, odorless, highly toxic gas. Can be deadly in small quantities if breathed over a certain period of time • Is produced by incomplete fossil fuel combustion, primarily in motor vehicles	Impairs ability of blood to carry oxygen; affects heart, lungs, and nervous system
d. **Sulfur dioxide** (SO_2)	
• A heavy, pungent, colorless gas • Formed primarily through the burning of coal, fuel oils, and wood • Major contributor to acid rain	Respiratory tract problems (acute and chronic); permanent damage to lung tissue
e. **Nitrogen dioxide** (NO_2)	
• An invisible gas produced when oxygen in the air combines with nitric oxide that is produced by fossil fuel combustion, primarily in motor vehicles • Major contributor to smog and acid rain	Respiratory illness and lung damage
f. **Lead** (Pb) (Airborne)	
• Exists in particles small enough to be carried by air currents • Generated primarily by automobiles using leaded gasoline. Currently, this source of lead has become inconsequential because most vehicles now operate with unleaded fuel	Causes brain damage and serious physical and mental impairment, especially in children

4. Environmental effects of air pollution

a. Greenhouse effect

- The greenhouse effect traps heat from the sun.
    - A layer of carbon dioxide and other gases above the earth's surface acts like a glass on top of a greenhouse.
    - Heat radiated from the sun passes through the carbon dioxide layer.
    - Part of the heat is trapped by the carbon dioxide layer; the rest is radiated back to the atmosphere.



    - Many scientists believe that an increase in the atmospheric concentration of carbon dioxide can eventually cause an increase in the earth's surface temperature—global warming. Others point out as carbon dioxide levels increase, plant growth, also increases, thereby holding the harmful effects of the "greenhouse effect" to a minimum.
- Theoretical effects of global warming
    - Sea levels could rise due to the melting of polar ice caps and the expansion of heated oceans.
    - As sea levels rise, coastal areas would erode and be covered by water.
    - Natural ecosystems would be greatly affected.

Information Sheet

- The excess heat would make many agricultural areas arid and nonproductive.

Note: Although many scientists are convinced the greenhouse effect will cause global warming because of rapid increases in the amount of various greenhouse gases during the past century, no evidence has been found to date to indicate actual global warming is taking place. Satellite data from the past ten years and water and air temperatures collected from ships from 1856 to 1986 show no evidence of a warming trend. So far, estimates and predictions of such changes are based on computer models using statistics as tools to predict change. In actuality, however, hard evidence shows the earth's surface has warmed less than 1 degree Fahrenheit during the past century. Also, geological and archeological evidence indicates the earth goes through a cooling and warming cycle about every 200 years based on solar activity. If the current 200-year cycle repeats itself, many scientists believe the earth will cool about 2 degrees in the next century.

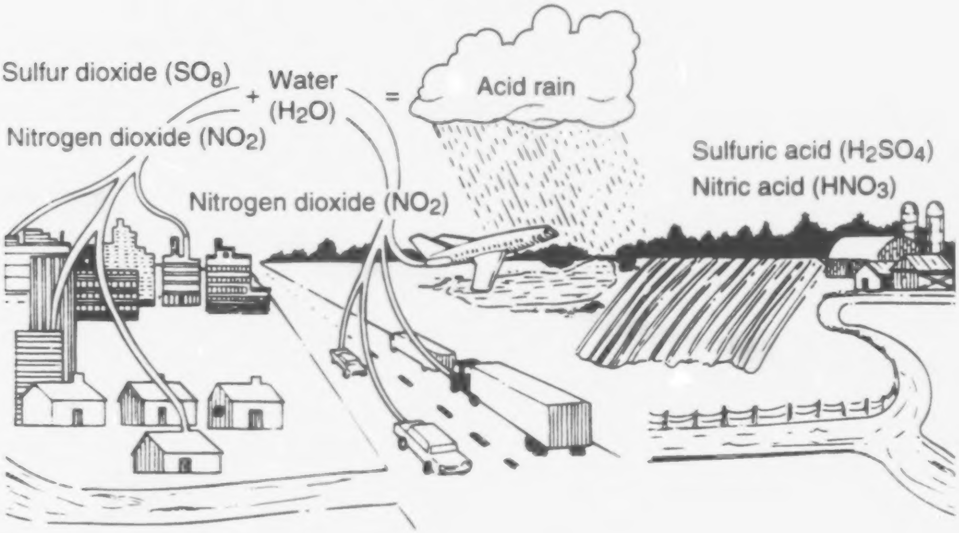
- Causes of the greenhouse effect—Increased carbon dioxide concentrations from
  - Natural decay of all vegetation
  - Burning fossil fuels
  - Burning organic matter (plants and animal waste)
  - Burning forests (deforestation)
- Solution to the problem
  - Use less fossil fuels.
  - Reduce forest burning practices.
  - Convert to nonfossil fuels such as nuclear, solar, and wind energy.

b. **Acid rain**

- Acid rain is atmospheric moisture which absorbs acid particles and falls to the earth. It has a pH value of less than 5.6.
  - The acid rain process begins with the emissions of sulfur dioxide and nitrogen dioxide from coal-burning electric power plants and automobile exhaust.
  - Sulfur dioxide (SO_2) combines with water (H_2O) to produce sulfuric acid (H_2SO_4).
  - Nitrogen dioxide (NO_2) combines with water (H_2O) to produce nitric acid (HNO_3).

Information Sheet

— Winds transport airborne acid particles hundreds of miles across state and national borders.


Sulfur dioxide (SO_8)
+
Water (H_2O)
=
Acid rain
Nitrogen dioxide (NO_2)
Sulfuric acid (H_2SO_4)
Nitric acid (HNO_3)
Nitrogen dioxide (NO_2)

- Effects of acid rain

  — Acid rain causes surface waters and soils to become more acidic.

  — Acidic water disrupts the reproductive cycles of fish.

  — Acid rain leaches metals from soils and harms fish, aquatic plants, and microorganisms when these metals reach lakes and streams.

  — Acid rain adversely affects forests and agriculture.

- Solution to the problem

  — Burn less coal.

  — Reduce automobile emissions.

  — Convert to cleaner fuels such as natural gas, nuclear, solar, or wind energy.

  — Develop more efficient emission control devices.

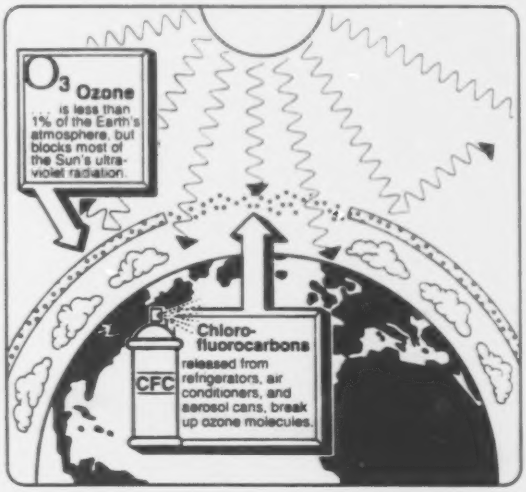
c. **Ozone shield**

- The ozone shield is a layer of ozone in the stratosphere 6 to 30 miles above the earth.

Information Sheet

- The ozone shield protects all earth organisms from dangerous ultraviolet radiation from the sun.

- The ozone shield is thought to be depleted by synthetic chemicals known as chlorofluorocarbons (CFCs).


O_3 Ozone
. . . is less than 1% of the Earth's atmosphere, but blocks most of the Sun's ultraviolet radiation.
CFC
Chlorofluorocarbons
released from refrigerators, air conditioners, and aerosol cans, break up ozone molecules.

- CFCs are compounds consisting of chlorine, fluorine, and carbon which attack and destroy ozone molecules.

- CFCs are used as agents for producing plastic foam, coolants for refrigerants and air conditioners, propellants for aerosol sprays, and cleansers for electrical parts.

  Note: Most CFCs are now banned by international treaty.

- Nitrogen oxides from combustion of fossil fuels also remove ozone from the stratosphere.

- Effects of ozone shield depletion
  - As ozone is depleted, increased amounts of ultraviolet (U.V.) radiation from the sun strike the earth.
  - Increased U.V. radiation causes skin cancer, decreases crop yields, reduces fish populations, and contributes to smog.

- Solution to the problem
  - Reduce the use and disposal of CFCs.
  - Reduce nitrogen oxide emissions from fossil fuel combustion.

d. Smog

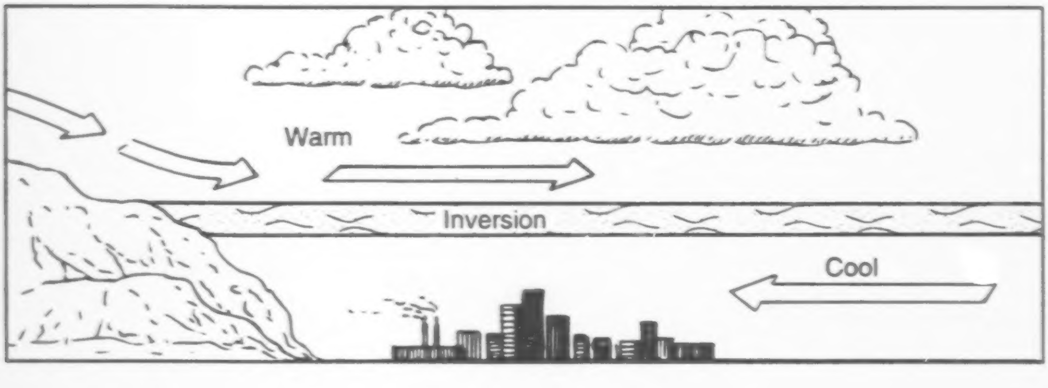
- Smog is a combination of **sm**oke and f**og** forming an atmosphere polluted with industrial emissions and automobile exhaust.

— Smog is generally confined to high population areas.

— Smog can be carried by winds and affect downwind rural areas.

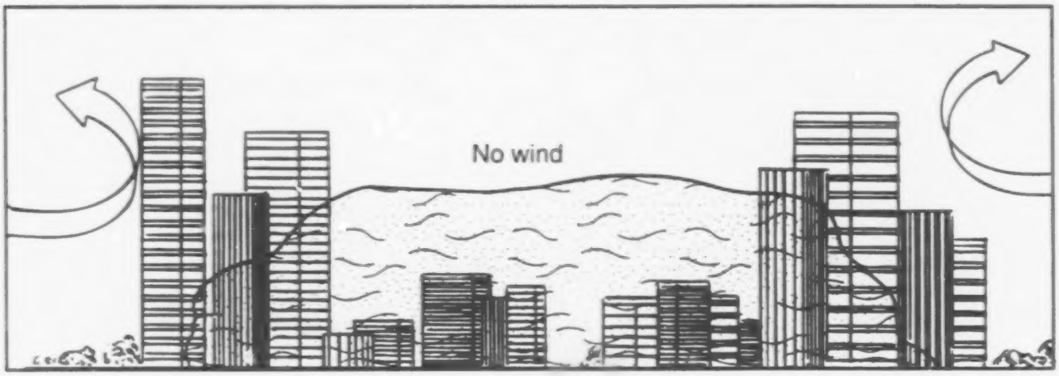
— Smog is more severe when accompanied by temperature inversions—when a layer of cool air is trapped by an upper layer of warm air.

Note: Inversions hold polluted air closer to the ground.



Information Sheet

- Smog is also more severe in stagnant air conditions where dilution by fresh air is minimized.



- Effects of smog
  - Trace heavy metals (lead, zinc, iron, cadmium) in smog cause serious health problems.
  - Numerous deaths are reported each year from smog, especially among those with respiratory illnesses.
  - People with respiratory problems are forced to stay indoors.
  - Smog reduces visibility contributing to traffic accidents.
- Solutions to the problem
  - Improve and maintain automobile emission controls.
  - Control industrial emissions.
  - Convert to cleaner energy sources.

5. Indoor air pollution

a. Indoor air pollution is a major health problem in the United States.

b. Indoor pollutant levels are frequently higher than outdoor concentrations.

c. Most people spend 90% of their time indoors.

Examples: At home, school, work, indoor social/recreational activities

d. Ventilation of buildings is important to reduce indoor pollution.

e. New homes and buildings, tightly constructed to conserve energy, are more likely to have air pollution problems.

Information Sheet

f. Short-term health effects of indoor air pollution

  - Eye, ear, nose, and throat irritations
  - Fatigue
  - Headaches
  - Irritability
  - Forgetfulness
  - Nausea

g. Long-term health effects

  - Permanent respiratory damage
  - Impairment of the nervous system
  - Cancer

6. Indoor air pollutants and their characteristics

a. Radon

  - Radon is a naturally-occurring gas emitted from radioactive decay of the element radium.
  - Radium is found in many types of rocks and soils.
  - Radon enters buildings through foundation cracks or seams, floor drains, and slab joints.
  - Radon is inhaled into the lungs, increasing the risk of lung cancer.
  - Radon is estimated to cause between 5,000 and 20,000 deaths per year in the United States.
  - Radon cannot be seen or smelled. However, it can be detected with specialized equipment and laboratory analysis.
  - Radon concentrations in buildings can be reduced with forced-air ventilation systems.

b. Environmental tobacco smoke

  - Environmental tobacco smoke is smoke that nonsmokers are exposed to in the environment.

Information Sheet

- Tobacco smoke contains numerous pollutants such as gases, heavy metals, particulates, and products of incomplete burning.
- Environmental tobacco smoke is reportedly linked to heart disease, lung cancer, and other health disorders.
- It is estimated that from 500 to 5,000 nonsmoker deaths per year are linked to environmental tobacco smoke.

c. Formaldehyde and other organic compounds

- Formaldehyde is found in furniture, foam insulation, and pressed wood products such as particle board.
- Organic compounds are found in tobacco smoke, dry-cleaned clothes, paints, and cleaning compounds.
- Health problems are eye and nose irritation and respiratory ailments.
- Sources of these contaminants should be located and removed.

d. Biological pollutants

- Heating and air conditioning systems can be breeding grounds for biological pollutants such as fungi, viruses, and bacteria.
- Heating and air conditioning systems can bring outdoor biological contaminants such as pollen and mold inside.
- Biological contaminants can cause viral infections and allergic reactions.

e. Pesticides

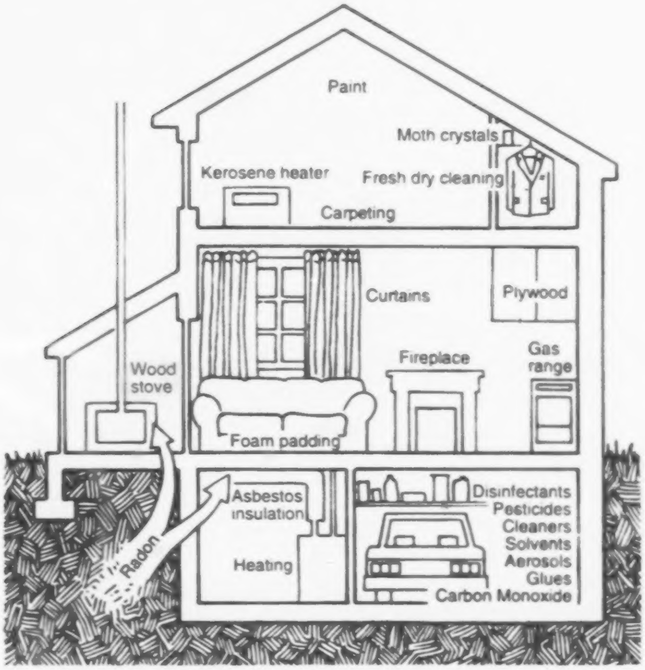
- Pesticides are chemicals used to destroy pests.
- Indoor and outdoor use of pesticides can be responsible for indoor air pollution.
- Even when used as directed, pesticides may pose a health threat.
- Pesticide exposure in sufficient quantities may cause cancer, birth defects, and other chronic health problems.

f. Asbestos

- Asbestos is a mineral fiber found in nature which is normally used for insulation.
- Asbestos has been used in the past for fireproofing and soundproofing in ceiling and floor tiles.
- Asbestos is still used for clutch discs and brake linings in automobiles.

Information Sheet

- Asbestos fibers are extremely small and become airborne when separated from parent material.
- Asbestos fibers can be inhaled into the lungs or ingested in food or water.
- Asbestos fibers are known to cause cancer.



Air Pollution in the Home

7. Air quality regulations

a. 1955 — Provided funds for the Public Health Service to do research on polluted air.

b. 1963 — Clean Air Act passed which expanded federally-sponsored research and provided grants to states to develop air quality programs.

c. 1965 — Clean Air Act was amended to reduce carbon monoxide and other air pollutants.

d. 1967 — Air Quality Act passed which set goals for air quality and called for cooperation between state and federal governments to establish air quality standards.

e. 1970 — Clean Air Act amendments directed EPA to develop uniform air quality standards in 247 air quality regions. Also required states to enforce air quality standards for stationary facilities such as power plants and industry. Provided for stiff fines on violators.

Information Sheet

f. 1977 — National Commission on Air Quality was established to evaluate federal laws concerning air quality.

8. **Methods of controlling motor vehicle emissions**

   a. Reduce the escape of hydrocarbons from fuel systems.

   b. Keep engines tuned.

   c. Maintain emission control systems and catalytic converters.

   d. Use lead-free gasoline.

   e. Reduce sulfur compounds during refining of diesel fuel.

   f. Use ethanol (grain alcohol) as a fuel.

   Note: Ethanol is a grain and biomass-based product.

   g. Use methanol (wood alcohol) as a fuel.

   Note: Methanol is a petroleum-based product.

9. **Methods of controlling air pollution from industry and electrical power generating plants**

   a. Install equipment (scrubbers) to remove air contaminants from stack exhaust.

   b. Remove pollutants from fuel source such as sulfur from coal.

   c. Use technologies which reduce contaminants in exhaust emissions.

   d. Use coal with low sulfur content.

   e. Convert operations to fuels which produce less air pollutants such as natural gas, solar, wind, and nuclear.

10. **Air quality trends in the United States (from 1970 to 1993)**

    a. Particulates (Total Suspended Particulates—TSP)

    - Particulate levels decreased 78%.
    - Decrease in particulate levels is due to installation of pollution control devices on sources of particulates.
    - Particulate levels in the atmosphere can be reduced further by improved pollution control devices.

    b. Sulfur dioxide (SO_2)

    - Sulfur dioxide levels decreased 30%.

Information Sheet

- Decrease in sulfur dioxide is primarily due to pollution control devices installed on coal-fired power plants.

- Sulfur dioxide levels could decrease further if improved pollution control devices are used.

- By 1994 over-the-road diesel fuel was mandated to be sulfur free and dyed to ensure proper identification.

c. Carbon monoxide (CO)

- Carbon monoxide levels decreased 24%.

- Decrease in atmospheric carbon monoxide is due largely to emission control devices on motor vehicles.

d. Ozone (O_3)

- Ozone levels decreased 12% from 1983 to 1993.

  Note: From 1970 to 1983, ozone levels were reduced 13%.

- Decrease in ozone is due to emission control devices on automobiles and improved emission control of electric power generators and industries.

- Atmospheric ozone should continue to decline as control technology is improved.

  Note: It should be understood that ozone is a pollutant in the air we breathe, but the ozone shield high above the earth protects us from harmful radiation. Also, some of the pollutant ozone is indeed carried by wind into the stratosphere where it joins the ozone shield.

e. Nitrogen dioxide (NO_2)

- Nitrogen dioxide levels increased 14%.

- Although major strides have been made in reducing NO_2 emmissions from auto exhaust, the substantial increase in miles driven and traffic volume has offset reductions.

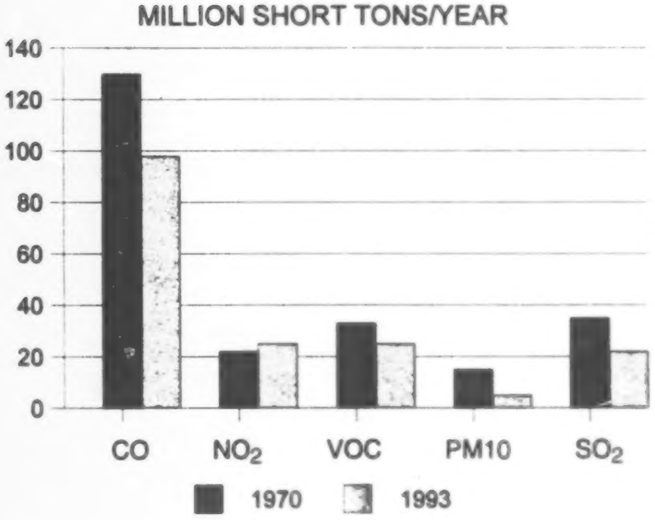
f. Lead (Pb)

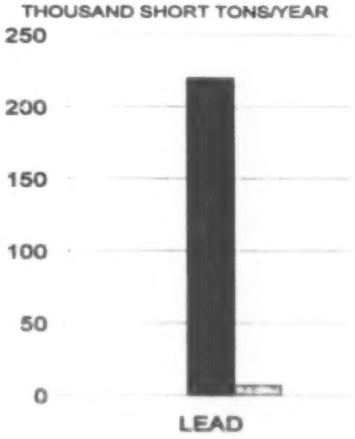
- Lead in the atmosphere decreased 98%.

- The decrease in atmospheric lead is primarily due to removing lead from gasoline.

Information Sheet

- Atmospheric lead is expected to continue to decline, but at a slower rate than it has over the past 20 years.





Courtesy of U.S. Environmental Protection Agency

11. **Global considerations in air resource management**

a. Air pollutants generated in one country may affect neighboring countries or the world.

- Sulfur dioxide emissions from coal power plants in the United States have caused acid rain in Canada.
- Burning of rain forests in South America may contribute to the greenhouse effect, causing world climate change.
- Synthetic chemicals from global industries may deplete the ozone shield causing serious health problems worldwide.

b. International cooperation will be needed to solve are pollution problems.

Information Sheet

12. Career opportunities in air resource management

a. Meteorology

b. Environmental science

c. Air quality management

d. Physics

e. Air quality engineering

f. Physical, chemical, and engineering technicians

Note: Salaries of individual careers will depend on level of education and years of experience.

Air Resource Management
Unit 5

Assignment Sheet 1—Locate Sources of Air Pollution in Your Area

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Survey is thorough	_____
• Answers indicate cognitive grasp of unit information and critical thinking	_____
• Report is neat and legible	_____
• Report was completed on time	_____
• Worked cooperatively with others to reach a common goal	_____

Introduction: Air pollutants can create serious health hazards such as respiratory illness, lung damage, and brain damage. Air pollution can also cause serious environmental problems. Acid rain and smog are two common results of air pollution.

In this assignment you will survey your local area for sources of outdoor air pollution, and you will have an opportunity to learn about pollution control devices that are being used to combat air pollution.

Directions: Work in a team of 3 or 4, as assigned, to survey sources of outdoor air pollution in your area, then complete the following chart. Note the source, location, whether the pollution is obvious, and if any pollution control devices are being used. Select a team member to present your findings to the rest of the class. Every team member should be prepared to participate in the class discussion.

Pollution Source	Location	Is pollution obvious?	Pollution Control Device/Description

Air Resource Management
Unit 5

Assignment Sheet 2—Write a Report on a Global Environmental Problem Related to Air Quality

Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
• Report is informative	______
• Problem is well-defined	______
• Solutions indicate cognitive grasp of subject	______
• Future outlook is logical	______
• Report is neat and legible	______
• Assignment was completed on time	______

Introduction: Although the United States is bordered on the east and west by the Atlantic and Pacific Oceans and although many countries are hundreds of miles from the North American continent, air pollutants generated in other parts of the world can have a significant impact on air quality in the U.S. Therefore, international organizations such as the United Nations and the World Health Organization must seek the cooperation of the international community in global air resource management. If tomorrow's air is to be cleaner, today's activities must include consideration of air quality.

In this assignment you will study a global environmental problem related to air quality and report on what is being done to solve the problem.

Directions: Select one of the following subjects for your report: greenhouse effect, ozone shield, acid rain, smog. Research your chosen subject and ask your teacher to help you contact government agencies such as the EPA or environmental groups who monitor air quality. Your report should be two to three pages (not counting the title page) and include the following:

- Title page—subject title, your name, class period, date
- Body of paper to include
  - Problem
  - Causes of problem
  - Solutions to the problem
  - Future outlook
- Bibliography—Sources of information for report

Air Resource Management
Unit 5

Assignment Sheet 3—Observe Particulate Matter Collected on a Petroleum Jelly Pad

Name ________________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Directions were followed	______
• Notes indicate differences in particulate matter collected	______
• Potential sources of particulate matter appropriate to area	______
• Report is neat and legible	______
• Assignment was completed on time	______

Introduction: Generally, if a health hazard exists as a result of air pollution such as dust, smoke, and fumes, it is announced on local radio and television. These "alerts" are based on data collected by health officials who are trained to use air sampling equipment. In this assignment, you will have an opportunity to observe particulate matter that exists in the air.

Directions: Thinly and evenly coat the white sides of two 8 × 10 inch pieces of poster board with clear petroleum jelly. Place one board outside in the open (on top of a fence or table) and place the other outside in an enclosure where it is protected from the direct effects of the wind (inside a porch, protected patio, or box enclosure with at least one side open to air circulation.

Observe the two pieces of poster board over a period of one week. Make notes each day concerning the overall appearance of each board and how one compares with the other. At the end of seven days, compare the two boards with a clean piece of white posterboard, and write a report (approximately two pages) on your observations. Include information on differences in color and amount of particulate matter collected. Also, include potential sources of particulate matter collected considering sources of pollution in your particular area.

Energy Resources
Unit 6

Objective Sheet

Unit Objective

After completing this unit, the student should be able to compare various energy resources, research the use of agricultural products as alternative energy resources, and perform an energy audit on a home. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to energy resources with their definitions.
2. Classify energy resources as renewable or nonrenewable.
3. Complete statements concerning coal energy resources.
4. Select true statements concerning oil energy resources.
5. Select true statements concerning natural gas energy resources.
6. Complete statements concerning nuclear energy resources.
7. Select true statements concerning hydropower energy resources.
8. Complete statements concerning biomass energy resources.
9. Select true statements concerning solar energy resources.
10. Complete statements concerning wind energy resources.
11. Select true statements concerning geothermal energy resources.
12. Match U.S. energy resources with their correct reserve supplies.
13. Draw a pie chart showing the uses of oil resources in the United States.
14. Select from a list the goals of energy conservation.
15. List ways to conserve energy.
16. List careers in energy resources.
17. Discuss the effects of a Middle East oil embargo. (Assignment Sheet 1)
18. Compare electricity production from coal and nuclear fuel. (Assignment Sheet 2)

Objective Sheet

19. Research and report on using agricultural products as alternative energy resources. (Assignment Sheet 3)

20. Perform an energy audit of your home. (Assignment Sheet 4)

Advanced Applications (Optional)

1. Analyze current reports concerning energy resources. (Assignment Sheet 1A)

2. Build and test a solar collector. (Job Sheet 1A)

3. Build and operate a methane generator. (Job Sheet 2A)

Energy Resources
Unit 6

Information Sheet

1. **Terms and definitions**

   a. **Barrel (bbl)**—A measure of volume of petroleum products; equal to 42 U.S. gallons

   b. **Combustion**—The chemical process of burning which releases heat, light, and chemical by-products

   Note: Each time a fuel is burned in a combustion process, some type of pollutant is released into the air.

   c. **Energy**—The capacity to produce motion, heat, or light

   d. **Energy conservation**—Planned management of energy resources which conserves, protects, and prevents waste

   e. **Energy reserves**—Energy resources which have not been used

   f. **Energy resources**—A measure of national wealth by the production of usable power such as heat and electricity

   g. **Fossil fuels**—Hydrocarbon compounds derived from the remains of organisms (plants and animals) buried millions of years ago

   h. **Liquified petroleum gas (LPG)**—A mixture of heavier gases, principally butane and propane, that are easily liquified at moderate pressure to make them easier to transport; are converted back to gases when pressure is released

   Note: LPG should not be confused with liquified natural gas (LNG) or compressed natural gas (CNG) that is primarily methane and that has to be put under cold temperatures and higher pressures to be liquified.

   i. **Nonrenewable energy**—Resources which cannot be replaced once they are used

   j. **Oil embargo**—An order by a government to prohibit oil shipments from its ports, generally prohibiting shipment to specific countries

   k. **Petroleum**—A natural, thick, yellow-to-black, flammable liquid hydrocarbon mixture found principally beneath the earth's surface

   l. **Recycle**—To reuse or process waste for beneficial purposes

   m. **Renewable energy**—Resources that can be replaced by natural regeneration of human efforts after they are used

   n. **Turbine**—Rotating device driven by wind, water, or steam that is used to provide power

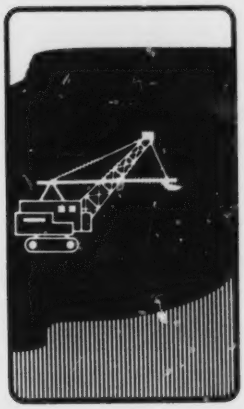
   o. **Uranium**—A radioactive element which gives off energy when its atom is split

Information Sheet

2. Classifications of energy resources

a. Nonrenewable energy resources

- Coal



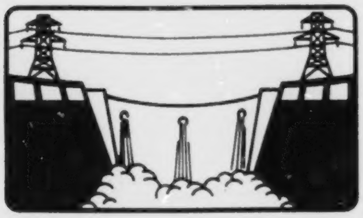
- Natural gas

- Oil

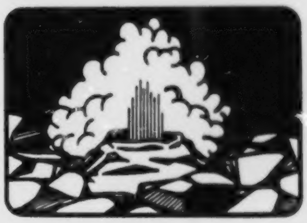
- Uranium

b. Renewable energy resources

- Hydropower

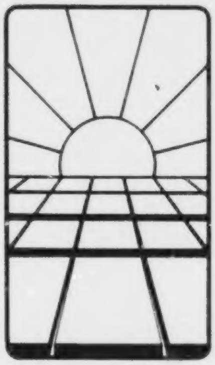


- Geothermal



Information Sheet

- Wind
- Solar
- Biomass



3. Coal energy resources

a. Coal is a dark brown to black, flammable, solid fossil fuel.

b. Coal is used for heating, electric generation, and as a raw material for many manufactured materials.

c. The cost of producing electricity from coal is 10% higher than electricity produced in nuclear power plants.

d. Environmental considerations of coal use

- Rehabilitation of surface areas disturbed by strip mining.
- Transportation of coal from mine to user facility.
- Air pollutants causing acid rain, greenhouse effect, and smog.
- Disposal of 10% of coal as ash following combustion.
- Thermal pollution from cooling system.

e. Future of coal as an energy resource

- The United States has an abundance of coal to use.
- The use of coal will reduce the amount of imported oil needed.

f. Future needs associated with coal use

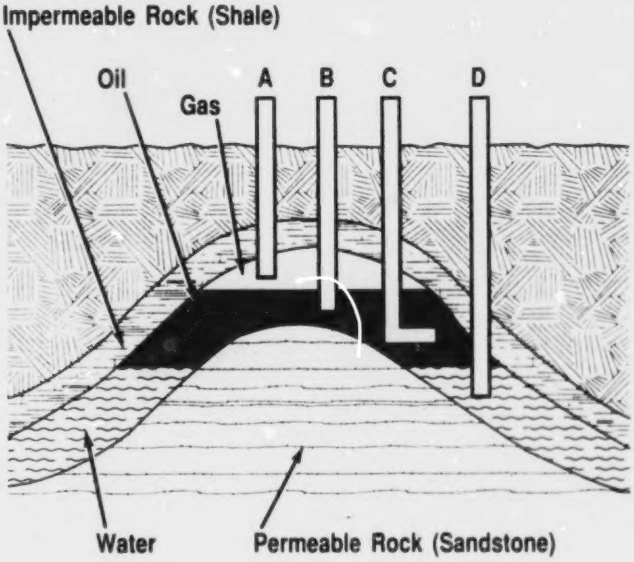
- Air pollutants must be reduced from coal combustion.
- Thermal pollution must be reduced.

Information Sheet

4. Oil energy resources

a. Oil (petroleum) is a natural, yellow-to-black, flammable, thick liquid fossil fuel.

b. Oil is produced by drilling a well to the resource formations.



Well A — Gas Well

Well B — Conventional Oil Well

Well C — Horizontally Drilled Oil Well (increases production)

Well D — Water Well

NOTE: Layers of rock trap oil and natural gas.

- If the oil bearing formation is under pressure, the oil will flow to the surface.

  Note: Formation pressure is usually attributable to large quantities of natural gas trapped above the oil deposits.

- Pumps are placed in the wells that do not flow.

c. Oil is used for heating, transportation fuel, and as a raw material that is refined into gasoline, naphtha, kerosene, lubricating oils, paraffin wax, asphalt, and a wide variety of derivative (petrochemical) products.

d. Oil is relatively economical to use. When used for heat, it compares favorably with coal.

e. Environmental considerations of oil use

- Producing and abandoned wells can pollute ground water.
- Transporting oil through pipelines and on ships poses an environmental risk.

Information Sheet

- Air pollution from oil use is a major cause of smog, acid rain, and the greenhouse effect.

f. Future of oil use

- Oil supplies in the U.S. are being depleted.
- The U.S. imports approximately 50% of the oil it uses. (Amount varies.)

g. Future needs associated with oil use.

- Alternate energy sources must be developed to reduce the dependence on foreign supplies.
- Conservation practices must be used to conserve oil supplies.

5. Natural gas energy resources

a. Natural gas is a mixture of hydrocarbon gases, principally methane, also ethane, butane, and propane.

b. Natural gas is generally found in the presence of oil in subsurface formations.

c. Gas is recovered by drilling to the gas bearing formation. Most natural gas formations are pressurized, forcing the gas to the surface.

d. Natural gas is used for heating, cooking, transportation (as compressed natural gas) and in the manufacture of organic compounds and products, such as fertilizers.

e. Natural gas is an economical source of energy which competes favorably with coal.

f. Environmental problems associated with gas combustion are minimal as compared with coal, oil, and nuclear fuels.

- Natural gas seldom needs refining prior to use.
- By-products of gas combustion add to the greenhouse effect.

g. Limitations of natural gas use

- U.S. supplies are limited.
- Gas must be transported by pipeline, limiting its use.

Note: When natural gas is put under pressure, it can be liquified which makes it easier to transport.

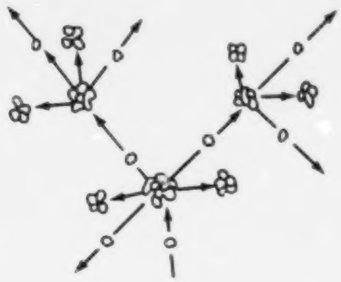
h. Future needs associated with natural gas use

- Gas supplies must be conserved.
- Alternate energy sources must be developed.

Information Sheet

6. Nuclear energy resources

a. Nuclear energy is produced from uranium which gives off energy when uranium atoms are split.



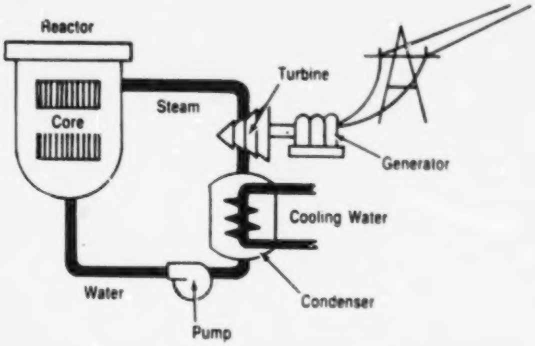
b. Uranium is a naturally-occurring element.

c. While traces of uranium are common in soils around us, commercial quantities are found in Colorado, Wyoming, and along the Texas coast.

d. Uranium is found in pore spaces in sandstone where it was deposited by ground water movement.

e. Uranium is mined by the same methods as coal and other minerals, either by shaft mines or open-pit methods.

f. Uranium is primarily used to power nuclear reactors which generate electricity.



g. Nuclear energy created by uranium can produce energy 10% cheaper than coal-fired plants.

Note: Actual energy production is cheaper than coal-fired plant operation, but start-up costs of a nuclear powered plant are much higher because of regulations, fees, and litigation with the environmental groups opposing nuclear power. No new nuclear plants have been brought on line since the 1970s.

h. Environmental problems associated with nuclear energy

- Fear of a reactor accident which would release radioactivity to the surrounding area.

Information Sheet

- Disposal of radioactive waste following use because it is deadly and because it lasts so long.

  Note: The half life of radium is 1,580 years which means the time it takes to lose half of its strength.

- Thermal pollution from cooling systems.

i. Future needs associated with nuclear energy

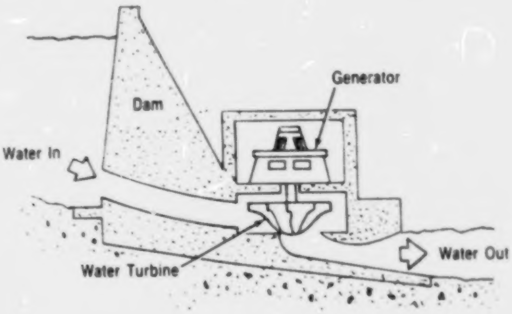
- Develop environmentally acceptable methods to dispose of nuclear waste.
- Reduce the cost of construction of nuclear electric generating plants.
- Promote the use of nuclear energy to conserve oil and gas supplies.
- Use nuclear energy to reduce air pollutants.

7. Hydropower energy resources

a. Hydropower is energy developed by the force of moving water.

b. Dams are used to harness the energy of falling water.

c. Water flowing through turbines turn generators which produce electricity.



d. The United States currently uses hydropower to generate 14% of its electricity.

e. Hydropower is the most economical source of electricity.

f. Environmental considerations of hydropower.

- Dams affect fish and wildlife, destroy scenic rivers, and flood agricultural land.
- Dams cause downstream water levels to fluctuate and affect water quality.

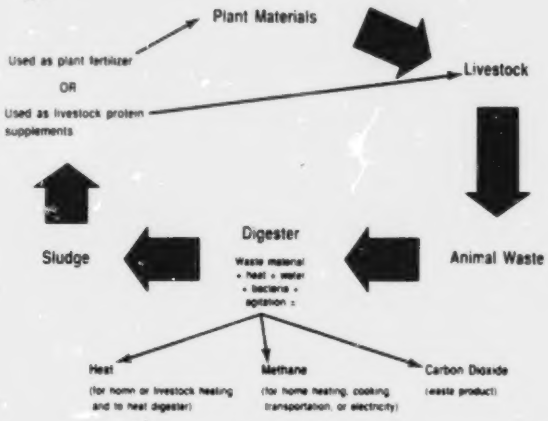
g. Future of hydropower

- More than 1900 dams in the United States are currently producing electricity.
- The number of hydropower generating plants is expected to increase.

8. Biomass energy resources

a. Biomass conversion or biogeneration uses plant materials and animal waste as sources of fuel.

- Wood is used as a direct heat source and to produce steam for electric generation.
- Grain is used to produce alcohol (ethanol) which can be mixed with gasoline and used in internal combustion engines.
- Animal waste and municipal sewage produce methane gas when broken down by bacteria.


Plant Materials
Livestock
Used as plant fertilizer
OR
Used as livestock protein supplements
Animal Waste
Digester
Waste material + heat + water + bacteria + agitation =
Sludge
Heat
(for homn or livestock heating and to heat digester)
Methane
(for home heating, cooking, transportation, or electricity)
Carbon Dioxide
(waste product)

b. Wood supplies less than 2% of the total energy demands in the U.S.

c. Alcohol supplies less than 1% of total U.S. energy demands.

d. The economics of biomass as an energy source is dependent on the cost of competing resources such as coal, oil, and natural gas.

e. As grain consumption from alcohol production increases, food prices also increase.

f. The cost of producing alcohol from grain is about three dollars per gallon.

g. Environmental considerations

- While the current supply of wood in the U.S. is adequate to supply current needs in biogeneration, increased consumption could result in shortages.
- Serious air pollution problems result from wood burning.
- Many people feel that grains needed for food should not be used to produce fuel.
- When biomass is converted, carbon dioxide is also produced which adds to the greenhouse effect.

Information Sheet

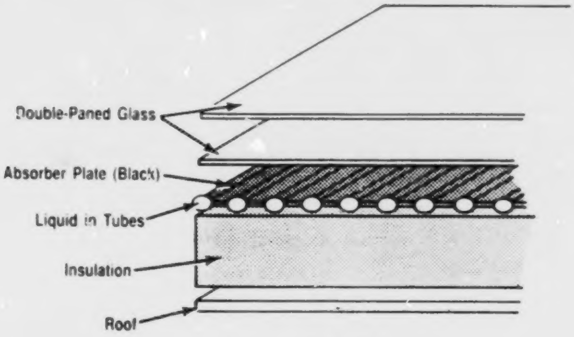
h. Future of biomass in energy production

- If fossil fuel prices increase, biomass energy will be used more.
- Goal for biomass energy is to increase production 11% by the year 2000.

9. Solar energy resources

a. Solar low temperature systems

- Energy from the sun is converted to useful heat called solar power.
- Solar collectors are used to store and transmit heat.



- Once installed, solar systems using solar collectors for producing space heat and hot water are very economical.

  Note: Initial purchase price is much higher than conventional gas or electric furnaces and water heaters.

- Installation cost of solar systems for an average home ranges from $5,000 to $10,000.
- Solar systems supply between 40-60% of space heat and hot water needs for a home.
- Solar systems are not economically competitive at the present time for cooling a home.
- Environmental considerations of solar energy
  - Solar energy is a clean source of energy.
  - Use of solar energy will reduce the amount of pollutants produced by other energy sources.
- Future of solar energy resources
  - Solar heating will continue to be used and increase in popularity.
  - Solar systems have been installed in homes and commercial buildings.
  - The U.S. is utilizing solar energy resources to conserve energy and to reduce its dependence on foreign sources of oil.

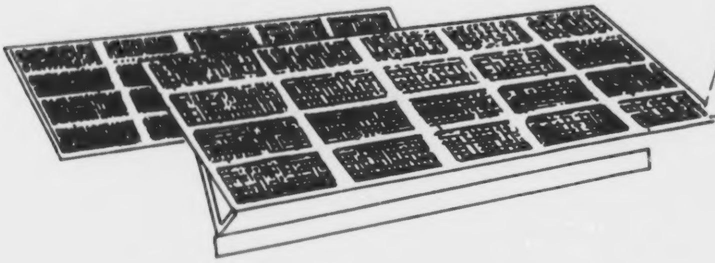
Information Sheet

b. Solar high temperature systems

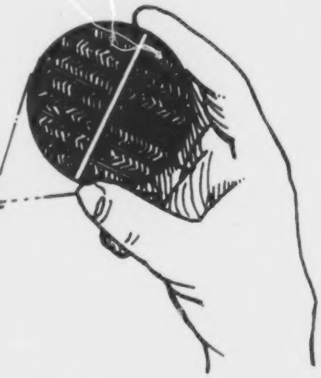
- High temperature solar systems concentrate sunlight to produce temperatures as high as 480°C (900°F).
- This temperature is required to convert water to high pressure steam required to turn turbine generators and produce electricity.
- High temperature systems cost less to build and operate than coal-fired plants.
- Environmental problems associated with high temperature systems are few.
    - Cooling water for condensing steam will present a disposal problem.
    - A system large enough to supply electricity to 15,000 homes would require 1 square mile of land.
- Future of high energy systems
    - Further research and development is needed before systems can become widely used in commercial operations.
    - Land requirements are a concern for large populations.

c. Solar photovoltaic systems

- Photovoltaic devices use semiconducting materials to convert sunlight



Photovoltaic Modules



A Single-Crystal Silicon Solar Cell

- Materials required to manufacture photovoltaics are available in almost unlimited quantities.
- Electricity produced from photovoltaic systems is currently not economical to use in homes and other commercial applications.
    - A one square meter photovoltaic cell will run a 100-watt light bulb.

  - Current uses of photovoltaic cells are limited to satellites, remote field applications, and calculators and small electrical devices requiring small quantities of electricity.

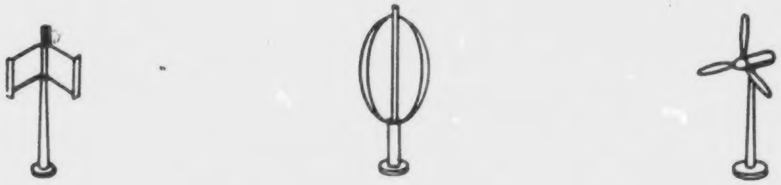
- Environmental problems associated with electrical production from photovoltaic cells are minor.
  - Disposal of the cells at the end of their 10-year life
  - Aesthetics due to the space needed for their use

- The future of photovoltaic systems
  - If efficiency is improved and costs are reduced, photovoltaic electricity could be the energy of the future.
  - It is estimated that by the year 2000, 5 million Americans will be using electricity generated by photovoltaic cells.

10. Wind energy resources

a. Wind energy is energy developed by the movement of air.

b. Wind energy is usually harnessed by windmills or wind machines.



Vertical Axis   Vertical Axis   Horizontal Axis

Types of Wind Machines

c. Windmills convert wind energy into mechanical energy which powers electrical generators or mechanical pumps.

d. Electricity produced by windmills for home use is very efficient; however, installation and maintenance costs have restricted windmill use.

e. Large-scale wind machines capable of producing commercial quantities of electricity are still in the developmental stages.

f. Environmental problems associated with windmills are minimal.

- Large wind machines are noisy and distracting.
- Birds are killed by their operation.

g. Limitations of wind energy as a power source

- Minimum wind speeds of 10 mph are necessary.
- Storage batteries are necessary to store energy during low wind conditions.
- If storage batteries are not used, an energy backup is necessary during low wind conditions and windmill maintenance.

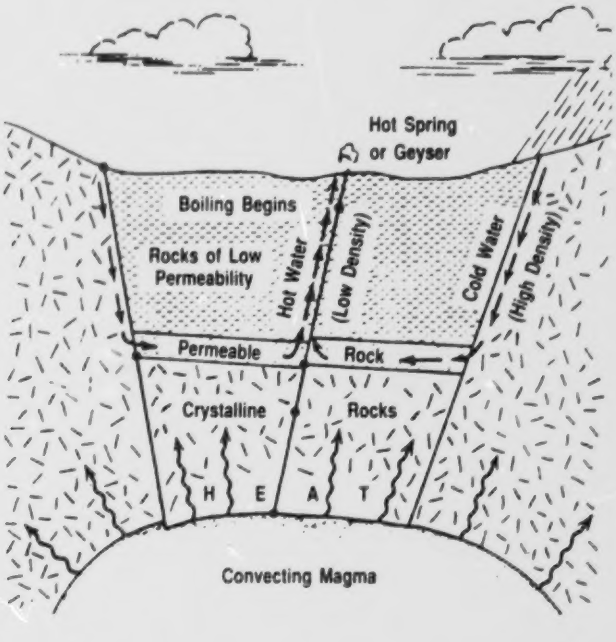
h. Future of wind energy

- Small windmill systems have a promising future in small communities, farms, and rural homes.
- In order to supply 1% of U.S. energy needs, approximately 3000 large windmills and 30,000 small windmills would be needed.

11. Geothermal energy resources

a. Geothermal energy is produced by drilling wells to underground steam formations.

Note: In some cases wells are drilled to the earth's hot underlayment and water is circulated to this region where it turns to steam before it is returned to the surface to heat or turn turbines.



b. Steam from pressurized formations is used to drive turbine generators which produce electricity.

c. Electricity produced from geothermal energy is competitive with other energy sources.

Information Sheet

d. Environmental considerations

- Air pollution from hydrogen sulfide gas in steam
- Water pollution from salt in the geothermal steam
- Increased seismic activity when steam pressures are reduced

e. Future uses of geothermal energy are promising.

- Electric generation
- Space heating in homes and industry
- Greenhouse heating

f. Limitations of geothermal energy

- Environmental problems must be solved.
- Most geothermal resources are located in the West.

12. U.S. energy reserves (based on current consumption)

Note: Adequate energy reserves are vital to the national economy, security, and standard of living of the American people.

a. Coal

- The U.S. coal reserves are the largest in the world, representing 25% of the world's total.
- This will supply U.S. needs for 300 years at present rate of consumption.

b. Natural gas

- This reserve would supply the U.S. for 54 years.
- Discovered resources of natural gas will supply 33 years.
- Estimated undiscovered resources of natural gas will supply 21 years.

c. Oil

- Oil reserves in the U.S. will supply U.S. needs for 36 years. (This includes proven and estimated undiscovered reserves.)
- The U.S. has only 4% of the world's supply of oil.
- The U.S. now imports 50% of its oil from other countries.
- The U.S. imports most of its oil from the Middle East which has 66% of the world's supply.

Information Sheet

d. Uranium/nuclear fuel

  - The U.S. has 25% of the world's supply of this energy resource.
  - This supply will last 200-300 years.
  - Nuclear energy currently supplies 17% of the electricity used in the U.S.

e. The U.S. is currently using 42% of its hydropower resources.

f. Geothermal, solar, biomass, and wind energies have great potentials; however, due to higher costs they will produce less than 3% of U.S. energy in the near future.

13. Use of oil resources in the U.S.

a. Residential (5 million BBl/day)

  - Heating and air conditioning
  - Lighting
  - Appliances

b. Commercial/business (3.5 million BBL/day)

  - Lighting
  - Heating and air conditioning
  - Light machinery

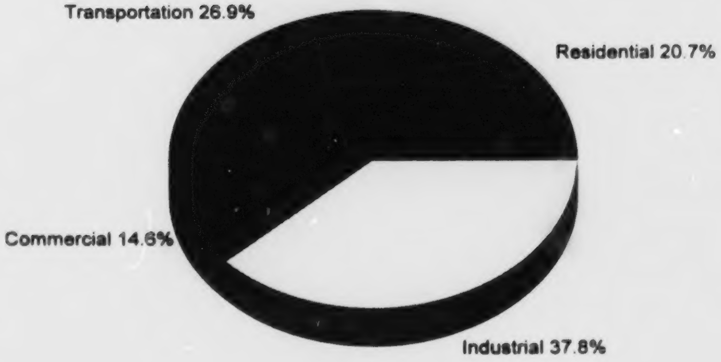
c. Industrial (8.6 million BBL/day)

  - Heavy machinery
  - Heating and air conditioning
  - Refining processes
  - Manufacturing processes and products

d. Transportation (6.4 million BBL/day)

  - Cars and light trucks
  - Trucks, trains, buses, aircraft, and ships

Information Sheet



14. Goals of energy conservation

a. To save money

b. To improve the environment by reducing harmful emissions from energy use

c. To reduce the amount of energy that must be produced to meet demands

d. To reduce our reliance on foreign energy for political and economic reasons

15. Ways to conserve energy

a. Residential

- Build energy-efficient homes.
- Insulate and weatherstrip existing homes.
- Turn off lights when not needed.
- Reduce thermostat settings in winter.
- Purchase energy-efficient appliances.
- Conserve hot water use.
- Recycle household products and compost yard waste.

Information Sheet

b. Transportation

- Increase vehicle fuel economy by reducing weight.
- Reduce speed.

  Note: When the national speed limit was reduced to 55 mph, 200,000 barrels of oil per day were saved.
- Use car pools.
- Increase fuel-efficiency of engines.
- Improve aerodynamics of vehicle design.

c. Commercial/businesses

- Similar to residential efforts including energy-efficient buildings and conservation measures.
- Install alternate energy devices such as solar.

d. Industrial

- Turn off equipment when not in use.
- Improve equipment efficiency.
- Improve manufacturing processes.
- Reuse heat generated. (Co-generation)
- Recycle raw materials.

e. Electricity generation

- Conserve energy resources which are in short supply in the U.S.
- Generate electricity by converting to U.S. energy resources which are renewable or that will last several hundred years such as coal, nuclear, hydropower, solar, or wind energy.

16. Careers in energy resources

Note: The careers listed below are professional careers requiring college degrees. Numerous other positions such as technicians, aides, and laborers are available. Starting salaries are generally higher in the energy industry, if jobs are available, than in other regional careers. Salaries will depend on education level and job experience.

a. Engineer—petroleum, mining, nuclear

Information Sheet

b. Geologist

c. Chemist

d. Physicist—nuclear, geologic

e. Mineralogist

Energy Resources
Unit 6

Assignment Sheet 1—Discuss the Effects of a Middle East Oil Embargo

Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
• Effects are feasible and well thought out	______
• Lists are thorough	______
• Participated in class discussion	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: Twice in the 1970s Middle East nations refused to sell oil to the U.S. because of political beliefs. Each time the effects rippled throughout the U.S. economy—affecting prices, interest rates, industrial output, etc. This exercise will lead you through possible effects of an oil embargo today—when nearly half again the amount of oil is imported into the U.S. as it was in 1973.

Directions:

1. Use two separate sheets of paper.
2. Assume the U.S. receives 50% of its oil from Middle East countries.
3. On one sheet list the effects of a Middle East oil embargo on the U.S.
4. On the other sheet list the effects on you personally.
5. Discuss your lists in class.

Energy Resources
Unit 6

Assignment Sheet 2—Compare Electricity Production From Coal and Nuclear Fuels

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Comparisons are logical	_____
• Comparisons are thorough	_____
• Assignment is neat and legible	_____
• Assignment was completed on time	_____

Introduction: The U.S. has had nuclear power plants operating since the mid 1950s with few emergencies or problems. Still the disaster at Three Mile Island in 1978 and the problems with nuclear waste disposal have set the nation at odds over the use of the atom to develop electricity. Coal-fired power plants, too, have their problems, but both nuclear and coal-fueled plants offer several centuries of production potential. This exercise will allow you to explore your ideas about each.

Directions: Compare the positive and negative aspects of electricity production from coal and nuclear fuels. Cover the following points:

- Renewable or nonrenewable resource
- Economics
- Safety
- Environmental problems
- Future use

What are your personal concerns about using coal and nuclear fuel?

Energy Resources
Unit 6

Assignment Sheet 3—Research and Report on Using Agriculture Products as Alternative Energy Resources

Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
• Report is thorough	_____
• Report is informative	_____
• Report is neat and legible	_____
• Assignment was completed on time	_____

Introduction: With conventional sources of energy limited, many people feel the products formed from plants hold the key to future energy sources. Biomass conversion does yield useful products, but there are economic and political considerations to be dealt with. This exercise will familiarize you with several aspects of the problem.

Directions:

1. Research the biomass conversion process.
2. List the agricultural products which can be used.
3. Identify and describe how these products are used as alternative energy resources.
4. Give your opinion of the future of agricultural products as alternative energy sources.
5. Compile your information into a written report.

Energy Resources
Unit 6

Assignment Sheet 4—Perform an Energy Audit of Your Home

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Audit is completed as required	_____
• Recommendations are appropriate	_____
• Assignment is neat and legible	_____
• Assignment was completed on time	_____

Introduction: Every home has some areas where energy use could be reduced without undo hardship on those who live there. This exercise will lead you to areas where you can save energy and money in your own home.

Directions: Complete the following inspection of your home and then make recommendations for improvement. Take notes on your inspection form.

1. Inspect doors to the outside.
   - Does house have storm doors? ____________
   - Do doors have weatherstripping? ____________
   - Are doors properly caulked? ____________
   - How many layers of glass are there in the doors?
     - ☐ single pane
     - ☐ double pane
     - ☐ triple pane
2. Inspect windows
   - Do windows close tightly? ____________
   - Are window frames properly caulked? ____________
   - Are there any broken windows? ____________

Assignment Sheet 4

- How many layers of glass are there in the windows?

  ☐ single pane

  ☐ double pane

  ☐ triple pane

- Are storm windows used during cold winter months? ____________

- What kind of frames do the windows have? (wood, metal, some of each) ____________

- How are windows covered inside to control light and prevent heat loss and gain?

  Blinds ____________

  Shutters ____________

  Shades ____________

  Curtains ____________

  Drapes ____________

  Reflective coating ____________

  Other ____________

  None ____________

- How many windows are located on each outside wall?

  North ____________

  East ____________

  South ____________

  West ____________

3. Inspect home exterior.

- Is recaulking needed? ____________
- Are other repairs needed to prevent heat loss? ____________
- Are plumbing entries tightly sealed? ____________
- Are crawl-space entries sealed? ____________
- Are mail-slots closing tightly? ____________
- Are dryer outlets sealed? ____________
- Are air-conditioning outlets sealed? ____________
- Are other exhaust outlets sealed? ____________

Assignment Sheet 4

4. Check for air leaks.

- Shut off forced-air furnace (if used in your home), and use a draft indicator to check doors. Are there air leaks? ____________
- Are there leaks around windows? ____________
- Are there leaks around corners of exterior walls? ____________
- Are there leaks around floor and floor boards? ____________
- Are there leaks around plumbing entries under sinks along exterior walls? ____________
- Are there leaks around electrical outlets and exterior walls? ____________
- Turn heat back on if you turned it off in Step 4a.

5. Inspect insulation and find out what kind of insulation the home has.

- Is there blown-in or blanket insulation in the attic or ceiling area? ____________ What thickness? ____________ What R-value? ____________
- Is there insulation in the walls? ____________
- Is there insulation in the floors/foundation? ____________
- Complete the following chart if the information is available.

Area	Recommended R-value	Insulation		R-value of Insulation
		Yes	No	
Ceiling/Roof				
Walls				
Floors/Foundation				

6. Inspect lighting.

- Are lights left on in rooms or areas when not in use? ____________
- Are fluorescent bulbs used in lights and fixtures whenever possible? ____________
- Are walls a light color for good reflection? ____________
- What kind of natural lighting is used? (windows, skylights) ____________

Assignment Sheet 4

7. Inspect fireplace if the home has one.

- Is the vent closed when not in use? ____________
- Does fireplace have glass doors to prevent heat loss? ____________
- Does fireplace have a method of circulating air and heat? ____________

8. Inspect hot water heater.

- Check water temperature with thermometer.
- Record temperature. ____________
- Are hot water pipes and water heater insulated? ____________
- Are any hot water faucets leaking? ____________
- Are the clothes washer and dishwasher used only with full loads? ____________
- Are flow restrictors used on shower heads and sink faucets? ____________

9. Check heating, ventilation, and air conditioning.

- Complete the following table (change names to fit rooms in the home.)

Room	Actual Temp.	Heat or Air Cond. Register		Thermostat in Room		Thermostat Setting
		Open	Closed	Yes	No	
Living						
Dining						
Kitchen						
Bathroom I						
Bathroom 2						
Bedroom 1						
Bedroom 2						
Bedroom 3						
Hall						

- Is the thermostat lowered at night? ____________
- Is the thermostat set at 65°F or lower in the heating season and 78°F or higher in the cooling season? ____________
- Is the heating system forced air or a convection system? ____________

Assignment Sheet 4

- Are heating and cooling vents clean and unblocked? ____________
- Are there filters on air conditioners and furnaces? ____________
- Are filters clean and unclogged? ____________
- Are air ducts insulated? ____________
- Are hot water pipes insulated? ____________
- Are kitchen and bathroom exhaust fans turned off when not needed? ____________

10. Make recommendations for improvements by filling in the chart below.

Low Cost Recommendations
High Cost Recommendations

Forestry
Unit 7

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify common trees and the major forest regions of the United States and explain the importance of forest land to the environment. The student should demonstrate these competencies by completing the assignment sheets, job sheets, and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to forestry with their definitions.
2. Distinguish among the main parts of a tree.
3. Identify the parts of the crown.
4. Identify the parts of the trunk.
5. Distinguish among the types of roots in a root system.
6. List ways trees are identified.
7. Select true statements concerning the photosynthesis process.
8. Complete statements concerning the growth of a tree.
9. Distinguish between the classifications of trees.
10. List common uses of trees.
11. Select from a list the benefits of forests to the environment.
12. List government agencies involved in forestry.
13. Identify the major forest regions of the United States.
14. Match the types of forest cuttings with their definitions.
15. List ways that tree stands regenerate.
16. Match forest measurements with their descriptions.
17. Identify measuring instruments used in forestry.
18. List forest enemies.

Objective Sheet

19. Select from a list the causes of fire.
20. Match types of forest fires with their descriptions.
21. Distinguish between categories of forest fires.
22. List benefits of controlled burns.
23. List career opportunities related to forestry.
24. Identify specific trees. (Assignment Sheet 1)
25. Determine the age of a tree. (Assignment Sheet 2)
26. Classify local trees. (Assignment Sheet 3)
27. Determine uses of wood and wood by-products. (Assignment Sheet 4)
28. Solve cord measurement problems. (Assignment Sheet 5)
29. Plant a bareroot tree. (Job Sheet 1)
30. Measure diameter of a tree. (Job Sheet 2)
31. Measure merchantable height of a tree. (Job Sheet 3)

Advanced Applications (Optional)

1. Project economic returns from a forestry plot. (Assignment Sheet 1A)
2. Analyze areas of conflict in maintaining forests and urban trees. (Assignment Sheet 2A)
3. Analyze current reports concerning areas of conflict in forestry. (Assignment Sheet 3A)

Forestry
Unit 7

Information Sheet

1. **Terms and definitions**

   a. **Bole**—The stem or trunk of a tree

   b. **Broadleaf**—Trees that have wide, flat leaves

   c. **Commercial forests**—Land capable of producing an economically useful forest

   d. **Chlorophyll**—Green photosynthetic coloring matter in plants

   e. **Conifer**—Trees that bear seeds in cones and that have long, narrow, (needle-like) leaves

   Note: Almost all conifers are evergreen.

   f. **Deciduous**—Plants that shed all of their leaves at the end of the growing season and remain leafless during the dormant (non-growing) season

   Examples: Maple trees, crab apple trees, lilac shrubs

   g. **Defoliation**—Loss of leaves, especially prematurely

   h. **Dendrology**—The study of trees

   i. **Evergreen**—Plants that retain their green foliage (leaves) throughout the year

   Examples: Pine trees, fir trees, hollies

   j. **Forage**—All browse and non-woody food that is available to livestock or game animals

   k. **Forest**—A complex community of associated trees, shrubs, other plants, and animals

   l. **Forestry**—The art and science of managing forests so as to yield, on a continuous basis, a maximum in quality and quantity of forest lands to satisfy human needs

   m. **Nutrients**—Mineral elements and compounds (including water and air) which a plant uses for tissue growth and maintenance

   n. **Photosynthesis**—The process of producing carbohydrates from water, carbon dioxide, chlorophyll, and light

   o. **Sap**—The liquid that circulates through the tissue of woody plants

   p. **Silviculture**—The art of producing and caring for a forest

   q. **Transpiration**—The release of water vapor by the leaves into the air

   r. **Tree**—A single-stemmed woody plant usually over 20 feet high at maturity

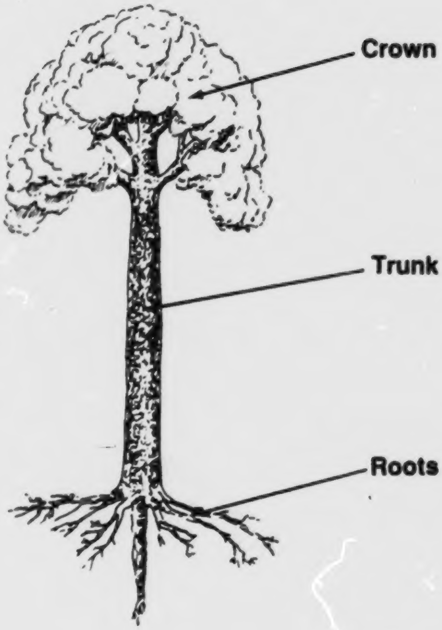
Information Sheet

2. Main parts of a tree

a. Crown — The foliage and flowering/fruiting part of the tree

b. Trunk — The main stem of the tree that transports nutrients

c. Roots — The underground part of a tree that extracts nutrients from the soil and atmosphere



3. Parts of the crown

a. Branches—Larger, outgrowing stems from the trunk

b. Twigs—Smaller stems from the branches

c. Buds—Small, growing projections at the ends or sides of stems that may develop into a flower, leaf, or shoot (new twig)

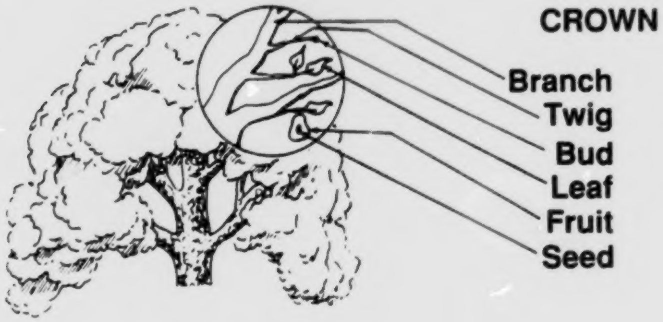
d. Leaves—Single unit of foliage that functions primarily in food manufacture through photosynthesis

e. Flowers—The reproductive part of a seed-bearing plant

f. Fruit—The edible, more or less soft product of a plant, consisting of ripened seeds and adjacent tissues or tissue only (seedless)

Information Sheet

g. Seeds — The small bodies produced by flowering plants which are capable of developing by germination (sprouting)



4. **Parts of the trunk**

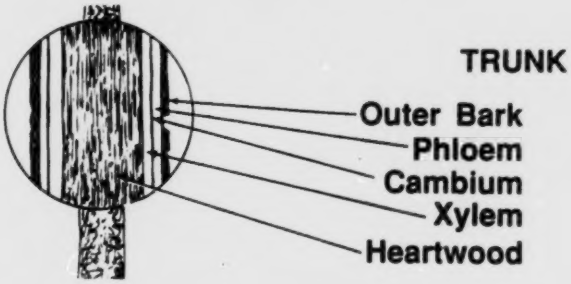
   a. Outer bark—Protects tree from injuries

   b. Phloem—Carries food from leaves to twigs, branches, trunk, and roots

   c. Cambium—Living cells that divide to form phloem and xylem

   d. Xylem—Carries sap from roots to leaves

   e. Heartwood—Dead cells that give strength to the tree



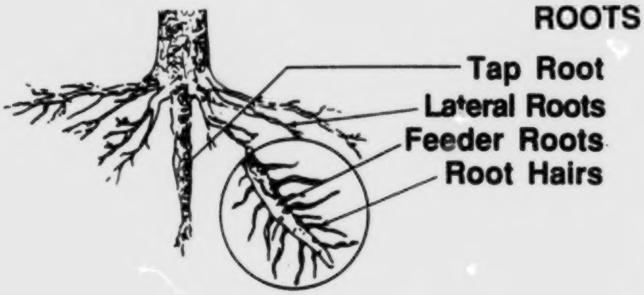
5. **Types of roots and their functions**

   a. Lateral roots—Grow horizontally and help keep the tree upright

   b. Tap roots—Grow vertically downward and anchor the tree

Information Sheet

c. Feeder roots and root hairs—Absorb water and minerals



6. Ways trees are identified

Note: Not all of the following are present on the tree at the same time depending on the season and the type of tree.

a. Leaves

b. Fruits

c. Bark

d. Buds

e. Twigs

f. Flowers

g. Wood

h. Growth habit

i. Overall form

7. Photosynthesis

a. The leaves of a plant use sunlight, carbon dioxide, chlorophyll, and water to produce carbohydrates.

b. Oxygen is given off as a by-product.

c. Carbohydrates, including sugars and starches, are later converted to fats and proteins.

d. Fats and proteins are used as food for growth and respiration or are stored in the plant for later use.

Information Sheet

8. Growth of a tree

a. Trees begin growth in the spring when the temperature is warm enough.

b. Growth is slower in the summer because of the hot, dry weather.

c. Cells are the building blocks of trees.

d. Root tips, twigs, and branches increase in length when cells become longer.

e. The tree increases in diameter when cells under the bark divide.

f. New growth from under the bark forms the annual ring.

g. One ring is produced each year.

h. The age of a tree can be determined by counting the number of rings from the center out to the edge.

i. The width of the growth ring indicates the tree's growing conditions that year.

9. Classifications of trees

a. Hardwood—Wood produced by deciduous (broadleaf) trees

b. Softwood—Wood produced by conifers

Note: This classification does not always indicate the degree of hardness of the wood. Some softwoods such as firs are actually harder than some hardwoods such as fruit trees.

10. Common uses of trees

a. Shade—As shields from the sun which help to cool nearby areas in the summer

b. Windbreaks—As shields from undesirable winds and to reduce wind erosion

c. Privacy and noise buffers—As shields from undesirable views or noises

d. Ornamental use—For beauty in a landscape

e. Fruit and nut production

f. Timber production—Various uses of wood products

Note: Depending on the type of tree, it may have several uses. For example, an apple tree is ornamental when it blooms, it produces fruit, it gives shade, and its wood may be used for various products.

Information Sheet

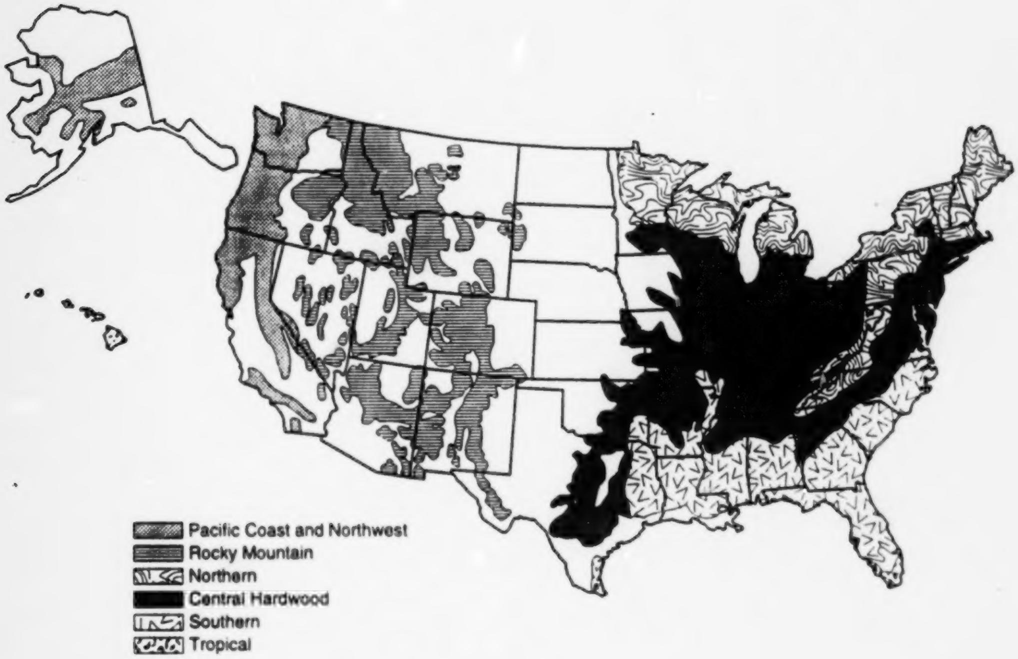
11. **Benefits of forests to the environment**
    - a. Influence the climate
    - b. Retain snowmelts
    - c. Prevent floods
    - d. Control water erosion
    - e. Control wind erosion
    - f. Provide habitats for fish and wildlife
    - g. Remove pollutants from the environment
    - h. Provide organic matter (leaves, decaying parts) to the soil
    - i. Provide oxygen to the atmosphere
    - j. Remove carbon dioxide from the atmosphere

12. **Government forestry agencies**
    - a. U.S. Forest Service
    - b. National Park Service
    - c. Bureau of Land Management
    - d. Bureau of Indian Affairs
    - e. State forestry service
    - f. City and county governments

13. **Major forest regions of the United States**
    - a. Pacific Coast and Northwest
    - b. Rocky Mountain (Western)
    - c. Northern
    - d. Central Hardwood
    - e. Southern
    - f. Tropical

Information Sheet

Forest Regions of the United States



14. Types of forest cuttings

a. Harvest cuttings—Removing financially or physically mature (marketable) trees for timber

- Selective cutting—Individual marketable trees are selected and cut; commonly used in uneven-aged stands
- Clear cutting—All the trees in a stand are harvested in a single operation; commonly used in even-aged stands

  Note: A variation of clear cutting is the seed-tree method where single or small groups of superior trees are left to produce seed for regeneration.

b. Intermediate cuttings—Cuttings made in an immature stand to improve the stand's composition and character

Note: Intermediate cuttings are often termed "timber stand improvement."

- Thinning—Removing surplus trees, thereby reducing competition and improving the growth and quality of the remaining trees
- Release cutting—Resembles thinning but is used to regulate species composition or improve the growth and quality of a young stand up to *sapling* size; also used to remove or control competing vegetation other than trees

Information Sheet

- Improvement cutting—Adjusts species composition and tree quality in previously unmanaged stands that are *older* than the sapling stage; removes trees of undesirable species, poor form, and unhealthy condition
- Salvage cutting—Removing trees killed or damaged by fire, ice, storms, or natural catastrophes
- Sanitation cutting—Removing trees damaged by diseases or insects

15. Ways that tree stands regenerate

a. Seeding (natural or direct)

b. Stump sprouting

c. Planting of seedlings

16. Forest measurements

a. Cord—A stack of wood 4 feet by 4 feet by 8 feet or 128 cubic feet

b. Board ft.—Rough wood one foot square and one inch thick

c. Cubic ft.—Rough wood cube one foot on each side; contains 12 board feet

d. Weight—Used commonly in the pulp and paper industry

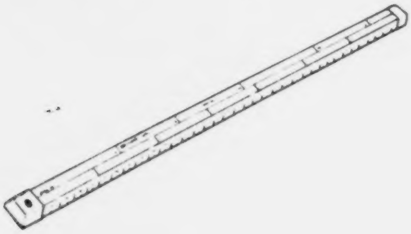
e. Piece—Refers to the number of boards of a specific dimension

f. Diameter—The distance across a tree at 4.5 feet above the ground

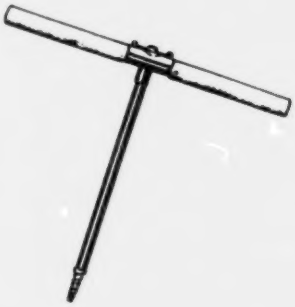
Note: This is also referred to as diameter breast high (DBH).

17. Measuring instruments used in forestry

a. Tree scale (Biltmore) stick— Used to measure tree diameter and tree height

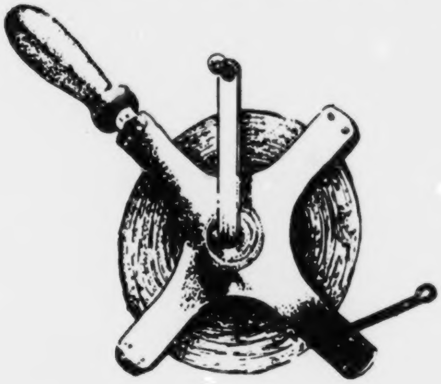


b. Increment borer — An augerlike tool used to extract cores from trees for the determination of growth and age



c. Diameter tape—Used to directly measure the diameter of a tree

d. Chains or tapes—Used to determine horizontal distances



18. Forest (tree) enemies

a. Insects

Examples: Bark beetles, reproduction weevils, pine tip moths, budworms, gypsy moths, tent caterpillars, leaf rollers, stem borers

b. Diseases

- Noninfectious diseases—Caused by environmental stress

  Examples: Maple decline, birch dieback, sweet gum blight

- Infectious diseases—Caused by parasites and fungi

  Examples: Rust, root rot, mistletoe, stem decay, canker, Dutch elm disease, oak wilt

c. Physical damage

- Overgrazing
- Construction of buildings and roads
- Wind

d. Fire

- Accidental
- Intentional

Information Sheet

19. **Causes of fire**
    - a. Arson
    - b. Debris burning
    - c. Cigarettes, cigars, pipes
    - d. Railroads
    - e. Logging operations
    - f. Lightning

20. **Types of forest fires**
    - a. Ground fires—Burn the organic materials beneath the surface litter
    - b. Surface fires—Burn surface litter
    - c. Crown fires—Burn from top to top of trees or shrubs

21. **Categories of forest fires**
    - a. Wildfire—Fires burning out of control
    - b. Controlled (prescribed) burn—Any burning that has been started intentionally as a forest management tool

22. **Benefits of controlled burns**
    - a. Reduces the hazard of wildfire
    - b. Readies the area for seeding and planting
    - c. Stimulates sprouts and seedlings, thereby improving food sources for many wildlife
    - d. Removes undesirable trees and brush
    - e. Controls forest diseases
    - f. Increases nutrient levels in forage
    - g. Creates openings in dense forest stands which encourages natural regeneration of forest
    - h. Makes access to the forest easier

Information Sheet

23. Careers in forestry

a. Foresters

Note: This includes timber sale inspectors, administrators, assistants, and silviculturists.

b. Forestry technicians

c. Loggers

d. Log scalers

e. Forestry researchers and industry representatives

Forestry
Unit 7

Assignment Sheet 1—Identify Specific Trees

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Directions have been followed	
• Ten samples are correctly mounted	
• Ten samples are correctly labeled	
• Assignment is neat and legible	
• Assignment was completed on time	

Introduction: For many people, "trees are trees are trees." Trees line our streets and highways reducing noise, pollution, and effects of wind, but many times are taken for granted. This exercise will acquaint you with 10 tree species in your local area.

Directions: Collect leaf samples of ten (10) common trees in your area. Mount these. Identify your trees according to resource books provided by your instructor or library. Label the respective mounts with the common tree name.

Forestry
Unit 7

Assignment Sheet 2—Determine the Age of a Tree

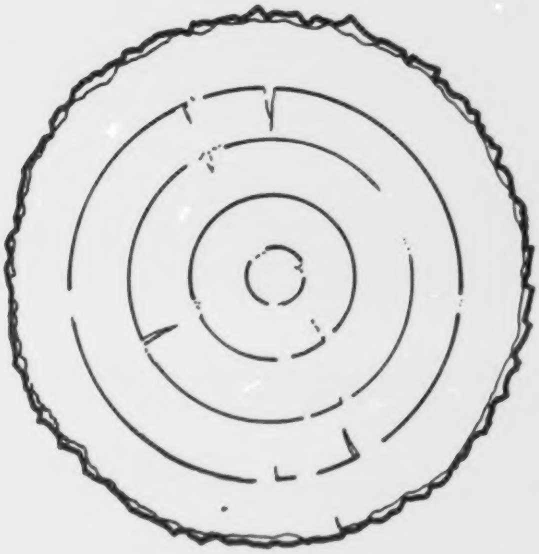
Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	______
• Assignment is completed on time	______
• Age is correct	______

Introduction: Because of natural growth patterns, trees grow incrementally each year, adding layer after layer of wood to their trunk diameter. These layers, or annular rings, are a record of the tree's life. This exercise will acquaint you with calculating a tree's age, and give you insight to the growing conditions present in each of its years of life.

Directions: Given the following cross section of a tree or one provided by your instructor, determine the age by counting the rings. Rings should be counted from the center out.

Age ______



Forestry
Unit 7

Assignment Sheet 3—Classify Local Trees

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	______
• Ten trees are listed	______
• Trees are classified correctly	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: There are two basic "families" of tree species, coniferous and deciduous. This exercise will acquaint you with each.

Directions: With the help of your instructor, develop a list of ten (10) trees which are most common in your area. Classify the tree by placing the proper symbols beside the tree name.

Name of Tree	C — Conifer or D — Deciduous	S — Softwood or H — Hardwood
1. ____________	________	________
2. ____________	________	________
3. ____________	________	________
4. ____________	________	________
5. ____________	________	________
6. ____________	________	________
7. ____________	________	________
8. ____________	________	________
9. ____________	________	________
10. ____________	________	________

Forestry
Unit 7

Assignment Sheet 4—Determine Uses of Wood and Wood By-Products

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Directions have been followed	_____
• Ten products and uses are listed	_____
• Assignment is neat and legible	_____
• Assignment was completed on time	_____

Introduction: Wood plays a large part in our lives, from the houses and buildings we use to the newspapers we read and a host of other products such as plastics and chemicals. In this exercise you will explore the vast variety of wood products.

Directions: Make a list of woods and wood by-products and their uses.

Woods or Wood By-Products	Uses
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Forestry
Unit 7

Assignment Sheet 5—Solve Cord Measurement Problems

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Answers are correct	______
• Assignment was completed on time	______

Introduction: This exercise is aimed at developing math skills using volumetric measures of wood—the cord.

Directions: Using the formulas provided, solve the following cord measurement problems by placing the answers in the spaces provided. Show your work.

a. 2 × 4 × 6 =
b. 2 × 4 × 8 =
c. 4 × 4 × 6 =
d. 4 × 4 × 4 =
e. 2 × 2 × 20 =
f. 4 × 6 × 8 =
g. 2 × 8 × 8 =
h. 4 × 4 × 20 =
i. 2 × 6 × 10 =
j. 8 × 8 × 10 =

1. Length × width × height = ______ cubic feet

a. ______
b. ______
c. ______
d. ______
e. ______
f. ______
g. ______
h. ______
i. ______
j. ______

2. Cubic feet/128 = ______% of a cord

a. ______
b. ______
c. ______
d. ______
e. ______
f. ______
g. ______
h. ______
i. ______
j. ______

Assignment Sheet 5

3. Percent of cord × cost of cord = ______ cost of the pile of wood

Note: Assume the cost of a cord for this problem is $70.00.

a. ______

b. ______

c. ______

d. ______

e. ______

f. ______

g. ______

h. ______

i. ______

j. ______

Forestry
Unit 7

Job Sheet 1—Plant a Bareroot Tree

Name ______________________ Attempt Number __________

Date ______________________ Overall Rating __________

Evaluation criteria	**Rating**
• Demonstrated proper use of equipment	______
• Properly prepared hole	______
• Properly placed tree	______
• Practiced safety rules throughout procedure	______

Introduction: Following the proper procedure when planting trees can make the difference in the tree's survival. Since the roots provide the necessary nutrients for the tree to grow, how they are positioned in the hole and the proper soil mixture surrounding them is important. In this activity you will learn how to plant a bareroot tree.

Directions: Before beginning this activity your instructor will divide the class into workteams. Each member should equally contribute to this activity. Your instructor will observe individual and group activities and rate your performance using the evaluation criteria.

A. Equipment and materials

- Spade
- Sand shovel
- Yard stick
- Plastic sheeting
- Peat moss or other organic matter
- Bareroot tree
- Safety equipment as needed—gloves, hard hats, eye and ear protection

B. Procedure

☐ 1. Assemble the needed equipment and materials, and carry them to the planting site.

☐ 2. Make a planting hole with the shovel, twice as wide and slightly deeper than the root mass of the tree.

☐ 3. As you remove soil from the hole, place it on plastic sheeting and mix it with organic matter or peat moss.

☐ 4. Adjust depth of hole by adding soil mixture so the tree will be the same depth or slightly higher than it was in the nursery.

Job Sheet 1

☐ 5. Place the yard stick across the hole to assist in the depth determination.

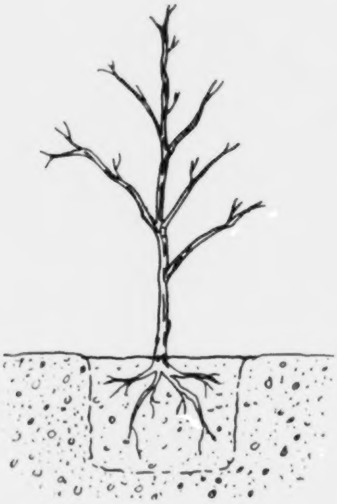
☐ 6. Remove any broken or damaged roots from the root mass.

☐ 7. Place the tree in the hole, making sure the roots are in a natural position.

☐ 8. Straighten tree, viewing it from all sides.

☐ 9. Fill in the hole with the soil mixture.

Figure 1



☐ 10. Thoroughly soak the soil to eliminate air pockets.

☐ 11. After water drains away, fill in with the rest of the soil mixture and soak again.

☐ 12. Return equipment and materials to the storage area and put away properly.

Evaluator's comments: ________________________________

____

____

____

Forestry
Unit 7

Job Sheet 2—Measure Diameter of a Tree

Name ______________________________ Attempt Number ____________

Date ______________________________ Overall Rating ____________

Evaluation criteria	Rating
• Demonstrated proper use of equipment	______
• Took accurate measurements	______
• Made correct readings	______
• Practiced safety rules throughout procedure	______

Introduction: By measuring the diameter of a tree you can determine how much lumber it will produce when cut. This is a simple method that may be used to select mature trees for cutting.

Directions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Equipment and materials

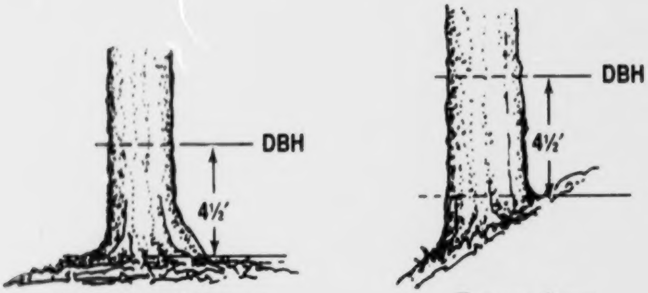
- Diameter tape
- Carpenter's tape
- Safety equipment as needed—gloves, hard hats, eye and ear protection

B. Procedure

☐ 1. Assemble the needed equipment and materials, and carry them to the tree site.

☐ 2. With the carpenter's tape, measure to a height of 4.5 feet (DBH) above the ground level or on uphill side of tree. (Figure 1)

Figure 1



Tree on Level Ground

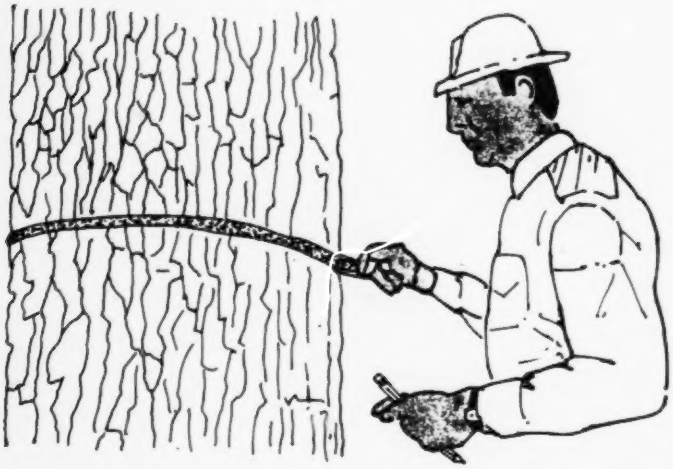
Tree on Slope

Job Sheet 2

☐ 3. Secure the end of the diameter tape to the bark at the 4.5 foot height.

☐ 4. Extend the diameter tape around the tree until it meets the end. (Figure 2)

Figure 2



☐ 5. Read the diameter directly from the tape to the nearest inch.

☐ 6. Return equipment and materials to the storage area, and put away properly.

Evaluator's comments: ____

____

____

____

Forestry
Unit 7

Job Sheet 3—Measure Merchantable Height of a Tree

Name ______________________ Attempt Number ____________

Date ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Demonstrated proper use of equipment	______
• Took accurate measurement	______
• Held tree scale properly	______
• Practiced safety rules throughout procedure	______

Introduction: Various species of trees have different growing patterns with some gaining height and breadth much faster. Loggers know the importance of selecting mature trees for cutting to ensure profitability. In this activity you will measure the merchantable height of a tree to determine how many logs it will produce.

Directions: Before beginning this activity your instructor will divide the class into workteams. Each member should equally contribute to this activity. Your instructor will observe individual and group activities and rate your performance using the evaluation criteria.

A. Equipment and materials

- Tree scale stick (Biltmore stick)
- 100 foot tape
- Safety equipment as needed—gloves, hard hats, eye and ear protection

B. Procedure

☐ 1. Assemble the needed equipment and materials, and carry them tot he site where three is to be measured.

☐ 2. Measure a distance of 66 feet from the base of the tree.

☐ 3. While standing at the 66-foot mark, hold the stick outright, 25 inches from the eye.

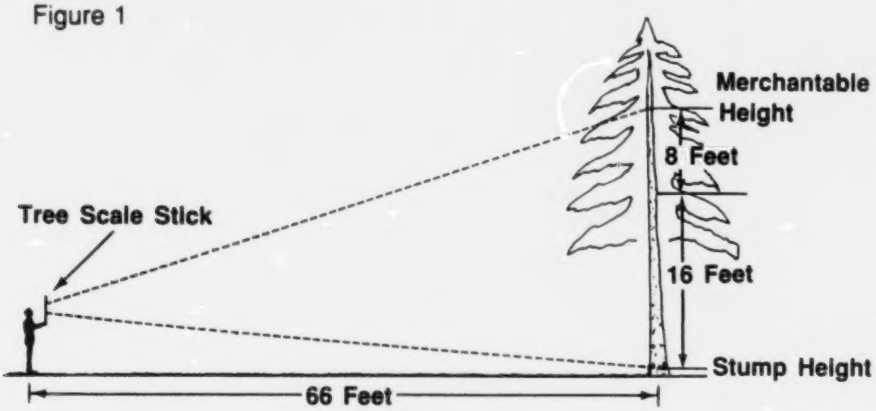
☐ 4. View the bottom of the stick at the cut-off point for sawtimber trees (stump height) (6-10 inches from the ground).

☐ 5. View the merchantable height of the tree (6″ diameter inside bark).

Job Sheet 3

☐ 6. Using the tree scale, determine how many 16-foot logs and half logs can be cut from the tree.

Figure 1



☐ 7. Return equipment and materials to the storage area, and put away properly.

Evaluator's comments: ______________________________

____

____

____

Wildlife Management
Unit 8

Objective Sheet

Unit Objective

After completing this unit, the student should be able to create a food web showing the interconnecting food chains in an ecosystem, compile a profile of a wildlife species, and discuss why it is necessary to manage wildlife. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to wildlife management with their definitions.
2. Complete statements concerning a food chain.
3. Show interconnections in a food web.
4. Complete statements concerning the predator/prey relationship.
5. Complete statements concerning the history of wildlife in the United States.
6. Match federal legislation concerning wildlife with their definitions.
7. Distinguish among major types of birds.
8. Distinguish between small mammals and large mammals.
9. List major fish species.
10. List U.S. endangered species.
11. List dangers to wildlife populations.
12. List agricultural practices that support wildlife.
13. Select from a list the wildlife activities that may cause damage to agriculture.
14. List ways to control wildlife damage problems.
15. Select true statements concerning public wildlife and private lands.
16. Match the types of private wildlife production areas with their descriptions.
17. List government agencies involved in wildlife management.

Objective Sheet

18. List career opportunities related to wildlife management.
19. Explain effects on a food chain when parts are removed. (Assignment Sheet 1)
20. Create a food web. (Assignment Sheet 2)
21. List fish and wildlife in your area. (Assignment Sheet 3)
22. Identify wildlife you see in a certain time span. (Assignment Sheet 4)
23. Compile a profile of a wildlife species. (Assignment Sheet 5)

Advanced Applications (Optional)

1. Investigate game animals, hunting seasons, and bag limits in your area. (Assignment Sheet 1A)
2. Develop a wildlife food plot. (Assignment Sheet 2A)
3. Develop a wildlife habitat.(Assignment Sheet 3A)
4. Make management decisions concerning a deer herd. (Assignment Sheet 4A)
5. Analyze current reports concerning wildlife management. (Assignment Sheet 5A)

Wildlife Management
Unit 8

Information Sheet

1. **Terms and definitions**

   a. **Bag limit**—The legal number of game animals that can be taken

   b. **Carnivores**—Animals that eat meat (other animals)

   c. **Cover**—Vegetation or other material providing protection to an animal

   d. **Ecosystem**—The interacting system of biological community and its nonliving environment

   e. **Edge**—The transitional zone where one cover type ends and another begins

   f. **Endangered species**—Species that is in danger of becoming extinct through all or part of its range

   g. **Exotic**—Species not native to an area

   h. **Extinct species**—Species that no longer exists

   i. **Food chain**—An arrangement of predator-prey relationship in an ecosystem

   j. **Food plot**—Area planted to maintain wildlife food supply

   k. **Food web**—The interconnected food chains within an ecosystem

   l. **Game animal**—Animal hunted by humans for its fur, flesh, or trophy value

   m. **Habitat**—The area where an animal or plant naturally lives and grows

   n. **Herbivores**—Animals that eat plants

   o. **Migrate**—To move from one region or climate to another for feeding or breeding

   p. **Nocturnal**—Active at night

   q. **Omnivores**—Animals that eat both animals and plants

   r. **Population density**—The number of animals in a defined area

   s. **Predators**—Animals that hunt, kill, and consume other animals

   t. **Prey**—An animal taken as food by a predator

   u. **Raptor**—A bird of prey

Information Sheet

v. **Refuge, reserve, or wilderness area**—An area of land set aside for the protection of wildlife

w. **Season**—Time set aside for legal hunting or fishing

x. **Species**—A group of organisms that resemble each other closely and that interbreed freely

y. **Surplus**—Amount over and above what is needed

z. **Upland**—The higher parts of a region, away from major rivers and streams

aa. **Wetlands**—Areas that stand in water a significant portion of time, especially as areas used by wildlife

bb. **Wildlife**—Mammals, birds, and fish not domesticated

cc. **Wildlife biology**—The study of wildlife and its interaction with an ecosystem

dd. **Wildlife management**—The scientifically-based activity of making land produce sustained annual crops of wild game

2. Food chain

a. A food chain is the connecting link between various organisms as they eat to survive and multiply.

b. On the first level of the food chain are the "producers".

Examples: Green plants—Grass, shrubs, trees

c. On the second level of the food chain are the "herbivores" which consume plant material to survive.

Examples: Grasshoppers, mice, rabbits, deer, birds

d. On the third level of the food chain are the "carnivores" which consume herbivores to survive.

Examples: Coyote, hawk, mountain lion, owl

e. Some organisms consume food at more than one level. They are called "omnivores".

Examples: Bears eat berries (from plants) and fish; birds eat plant nuts or fruit as well as worms and insects

f. Examples of straight food chains would include:

Grass shrubs , tree leaves → deer → mountain lion

Grass → grasshopper → frog → snake → hawk

Grass → mouse → owl

Information Sheet

3. Interconnections in a food web

a. A food web shows the interconnecting food chains in an ecosystem.

b. Each organism is generally a part of more than one food chain.

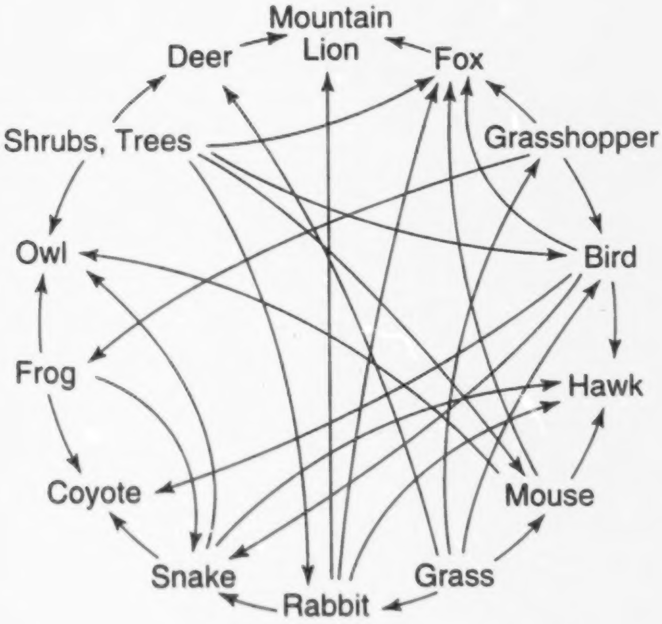
c. Not all food chains travel in a straight manner.

Example: An owl may consume a frog which has consumed a cricket. The owl may also consume a rabbit which has consumed grass.

d. Members of a food web are dependent on each other for survival. Any change in the ecosystem affects all members of that food web.

e. In a diagram which connects various organisms according to their food preference, the crossing lines form a food web.

Example: Food web



Note: Arrows point to the consumer.

4. Predator/prey relationship

a. Predators are not usually destructive, but they can be.

b. Predators can be beneficial.

- Predators can control the population of a prey species.
- Predators feed on pest animals.

- Control by predators can keep the prey species healthy.
- Predators maintain populations by killing weak individuals of the prey species.

c. Humans are the only predators capable of exterminating a prey species.

5. History of wildlife in the United States

a. North America became established in the world fur trade business as French trappers cooperated with Native Americans in the 1700s.

b. Westward expansion of settlers during the 1700s and 1800s was responsible for loss of wildlife habitat and aided market hunting.

- Massive herds of bison had been slaughtered by the 1880s.
- Native herds of elk, flocks of prairie chickens and passenger pigeons were nearly eliminated by 1900.

  Note: The last known passenger pigeon died in 1914.

c. States began setting bag limits and outlawing market hunting in the late 1800s.

d. Federal legislation began setting aside national parks and wildlife refuges in 1906.

e. Hunters and anglers asked for, and helped pass legislation to fund wildlife management.

- Pittman-Robertson Act, 1937

  Note: Pittman-Robertson Act funds have amounted to more than $2 billion since they were first collected.

- Dingell-Johnson Act, 1951

f. In 1934 federal legislation was passed requiring "Duck Stamps" for waterfowl hunting to provide funds for waterfowl habitat restoration.

Note: Canada also requires "Duck Stamps" for waterfowl hunting.

g. Hunting groups formed private fund-raising organizations to enhance habitat for various species.

- Ducks Unlimited
- Quail Unlimited
- Pheasants Forever

Information Sheet

h. There have been dramatic increases in formerly threatened species through science-based wildlife management.

- North American elk—Nearly 500,000 today, compared with fewer than 100,000 in 1920.
- Wild turkey—More than 2 million nationwide, compared with relatively few found only in some southern states in 1930.
- White-tail deer—More than 14 million nationwide, compared with fewer than 500,000 in 1920.
- Pronghorn antelope—More than 750,000 today, compared with fewer than 25,000 in 1920.

6. **Federal legislation concerning wildlife**

a. **Lacey Act**—Brought the federal government into the business of wildlife law enforcement.

b. **Fish and Wildlife Conservation Act**—Called for identification of fish and wildlife not taken for sport or commercial purposes.

c. **Migratory Bird Conservation Act (1934) or "Duck Stamp" Program**—Funded by a special annual fee paid by active hunters and non-hunting friends of wild waterfowl to acquire refuges and to lease wetlands for the primary benefit of migratory birds.

d. **Federal Aid in Wildlife Restoration Act (1937) or Pittman-Robertson Act**—Provided funding for wildlife management by placing an excise tax on firearms and ammunition (later on archery equipment); provides for nearly 70 percent of federal funds for wildlife study, restoration, and education.

e. **Federal Aid in Sport Fish Restoration Act (1951) or Dingell-Johnson Act**—Provided funding for fish management by taxing fishing and boating equipment.

Note: As amendments or refunding are added to the original bills, the names sometimes change, but the above names are still commonly used.

f. **Endangered Species Act (1973)**—Gave authority for protecting rare and endangered species to the U.S. Fish and Wildlife Service.

g. **North American Waterfowl Management Plan (NAWMP) (1986)**—Partnership between U.S. and Canada to protect 37 species of North American waterfowl (ducks, geese, swans) shared by both countries

Information Sheet

7. Major types of birds

a. Upland nonmigratory birds

- Grouse
- Quail
- Pheasant
- Wild turkey
- Partridge

b. Wetland migratory birds

- Ducks
  - Mallard
  - Teal
  - Wigeon
  - Redhead
  - Scaup
  - Ruddy
  - Shoveler
  - Wood
  - Merganser
  - Canvasback
- Geese
  - Canada goose
  - Snow goose
  - White fronted goose
- Cranes
  - Sandhill crane
  - Whooping crane
  - Blue heron

c. Raptors

- Eagle
- Falcon
- Osprey
- Hawk
- Owl

Information Sheet

8. Common mammals

a. Large mammals

- Elk (Wapiti)
- Deer
- Sheep
- Bison
- Bighorn sheep
- Mountain goat
- Moose
- Pronghorn antelope
- Bear

b. Small mammals

- Lynx
- Badger
- Wolverine
- Marmot
- Squirrel
- Prairie dog
- Beaver
- Muskrat
- Opossum
- Raccoon
- Weasel
- Mink
- Fox
- Coyote
- Porcupine
- Skunk
- Chipmunk
- Woodchuck
- Hare
- Rabbit
- Bobcat

9. Major fish species

- Bullhead
- Catfish
- Crappie
- Trout
- Bass
- Bluegill
- Pike
- Perch

10. U.S. endangered species

a. Endangered mammals

- Bat (ozark, gray)
- Grizzly bear
- Wolf (red, grey)
- Black-footed ferret
- Swift fox
- Jaguar
- Jaguarundi

b. Endangered birds

- Whooping crane
- Bald eagle
- Woodpecker (ivory-billed, red-cockaded)
- Eskimo curlew
- Interior least tern
- Peregrine falcon

c. Endangered fish

- Bonytail chub
- Humpback chub
- Leopard darter
- Gambusia (big bend, clear creek, pecos)
- Comanche pupfish
- Colorado River squawfish
- Greenback trout
- Central mudminnow
- Pearl dace
- Banded killfish

11. Dangers to wildlife populations

a. Illegal hunting

b. Predators

c. Starvation

d. Droughts

e. Storms

f. Diseases

g. Parasites

Information Sheet

h. Fires

i. Accidents

j. Human activities including pollution

k. Loss of habitats through development or agriculture

12. Agricultural practices that support wildlife

a. Farm around hills (contours) to control sediment that might enter and ruin ponds, lakes, and streams.

b. Leave fence rows undisturbed to provide cover so wildlife can travel to other areas.

c. Provide farm ponds and tanks for wildlife drinking water.

d. Use windbreaks and shelterbelts to provide habitat for wildlife.

e. Seed legumes and grasses to provide food cover for wildlife.

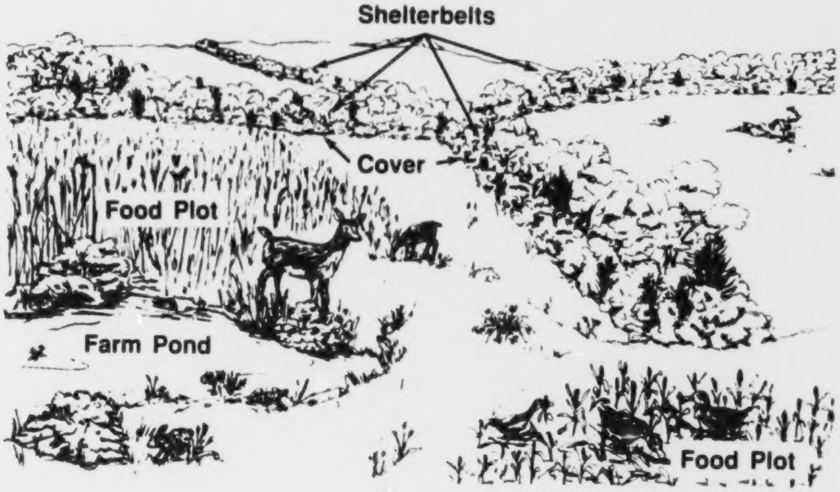
f. Leave brush and dead (den) trees to provide nesting cover for wildlife.

g. Prevent overgrazing on grassland to protect escape cover, nesting cover, and food for wildlife.

h. Leave crop residue on the land to provide food for wildlife and control erosion.

i. Provide food plot areas to keep wildlife away from crops.

j. Maintain existing wetlands to assure future wildlife habitat.



Information Sheet

13. Wildlife activities that may cause damage to agriculture

a. Carry diseases

Note: Diseases can be passed from wildlife to domestic animals and from domestic animals to wildlife.

b. Prey on domestic livestock and poultry

c. Feed on agricultural crops

d. Compete for grass on grazing lands

e. Feed on stored feed supplies

f. Cause damage to trees

g. Cause damage to buildings and equipment

14. Ways to control wildlife damage problems

a. Reduce the number of destructive animals.

b. Provide fencing or other mechanical barriers.

c. Use frightening techniques.

d. Encourage adequate game harvest by hunters.

e. Adjust agricultural practices.

f. Establish feeding and resting areas on noncrop lands.

15. Public wildlife and private land

a. Private lands can provide wildlife for recreation.

b. Landowners should be provided an incentive to support wildlife.

c. Many landowners prefer to see wildlife on their land.

d. Wildlife share with domestic animals the farm habitat including food, shelter, and space.

e. Most state and federal wildlife agency money is spent on public lands.

f. Many landowners receive compensation for good land management practices from the U.S. Department of Agriculture.

g. More than 80% of the game is harvested on private land.

Information Sheet

16. **Types of private production areas**

    a. **Cooperatives**—Landowners open their land in exchange for protection against random trespassing

    b. **Preserves**—Areas set aside exclusively for owners and members

    c. **Commercial wildlife enterprises**—Provide "package hunts"

    d. **Exotic and native big game ranches**—Provide a pay hunt

    e. **Farms**—Raise and sell wildlife animals, birds, and fish, or sell hunting leases

17. **Government agencies involved in wildlife management**

    a. State wildlife, conservation, and natural resource departments

    b. Fish and Wildlife Service

    c. Forest Service

    d. National Park Service

    e. Natural Resources Conservation Service (formerly Soil Conservation Service)

    f. Corps of Engineers

    g. Bureau of Reclamation

    h. Bureau of Land Management

18. **Careers related to wildlife management**

    a. Fishery biologist

    b. Hatchery manager

    c. Wildlife biologist

    d. Refuge manager

    e. Range management specialist

    f. Law enforcement

    g. Technicians (biological, fish, and wildlife)

    h. Conservationist

    i. Zoologist

    j. Writers

    k. Wildlife photographer

NR-231

Wildlife Management
Unit 8

Student Supplement 1—State Fish & Game Departments

Northeast Region

Maine	Department of Inland Fisheries and Game Augusta, ME 04330
New Hampshire	Fish and Game Department 34 Bridge Street Concord, NH 03301
Vermont	Vermont Fish and Game Department Montpelier, VT 05602
Massachusetts	Massachusetts Division of Fisheries and Game Westboro, MA 01581
Rhode Island	Department of Natural Resources 83 Park Street Providence, RI 02908
Connecticut	State Board of Fisheries and Game State Office Building Hartford, CT 06115
New York	New York Conservation Department Division of Game and Fish Albany, NY 12226
New Jersey	New Jersey Division of Fish and Game P.O. Box 1809 Trenton, NJ 08625

Atlantic Coast States

Delaware	Board of Game and Fish Commissioners Dover, DE 19901
Maryland	Department of Game and Inland Fish State Office Building Annapolis, MD 21401
Virginia	Commission of Game and Inland Fisheries Box 1642 Richmond, VA 23213
North Carolina	North Carolina Wildlife Resources Commission Raleigh, NC 27602

South Carolina
South Carolina Wildlife Resources Commission
P.O. Box 167
Columbia, SC 29202

Georgia
State Game and Fish Commission
401 State Capitol
Atlanta, GA 30334

Appalachian States

Pennsylvania
Game Commission
P.O. Box 1567
Harrisburg, PA 17120

West Virginia
West Virginia Department of Natural Resources
State Capitol
Charleston, WV 25305

Kentucky
Department of Fish and Wildlife Resources
State Office Building Annex
Frankfort, KY 40601

Tennessee
Tennessee Game and Fish Commission
706 Church Street
Nashville, TN 37203

Great Lakes States

Michigan
Department of Natural Resources
Steven T. Mason Building
Lansing, MI 48962

Wisconsin
Wisconsin Department of Natural Resources
Division of Conservation
Box 450
Madison, WI 53701

Minnesota
Minnesota Department of Conservation
Centennial Building
628 Cedar Street
St. Paul, MN 55101

Central States

Ohio
Department of Natural Resources
Division of Wildlife
1500 Dublin Road
Columbus, OH 43212

Student Supplement 1

Indiana
Department of Natural Resources
Indianapolis, IN 46209

Illinois
Department of Conservation
102 State Office Building
Springfield, IL 62706

Iowa
State Conservation Commission
East 7th & Court Avenue
Des Moines, IA 50308

Missouri
Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65101

Arkansas
Arkansas Game and Fish Commission
Game and Fish Building
Little Rock, AR 72201

North Dakota
North Dakota Game & Fish Department
Bismarck, ND 58501

South Dakota
Department of Game, Fish, and Parks
Pierre, SD 57501

Nebraska
Nebraska Game, Forestation & Parks Commission
State Capitol
Lincoln, NE 68509

Kansas
Forestry, Fish, and Game Commission
P.O. Box 1028
Pratt, KS 67124

Oklahoma
Department of Wildlife Conservation
1801 N. Lincoln
Oklahoma City, OK 73105

Gulf Coast States

Florida
Game and Freshwater Fish Commission
Tallahassee, FL 32304

Alabama
Alabama Department of Conservation
Game and Fish Division
Montgomery, AL 36104

Mississippi
State Game and Fish Commission
P.O. Box 451
Jackson, MS 39205

Louisiana

Louisiana Wildlife and Fisheries Commission
Wildlife and Fisheries Building
400 Royal Street
New Orleans, LA 70130

Texas

Texas Parks and Wildlife Department
Reagan Building
Austin, TX 78701

Rocky Mountain States

New Mexico

New Mexico Department of Game and Fish
State Capitol
Santa Fe, NM 87501

Arizona

Arizona Game and Fish Department
120 Arizona State Building
1688 W. Adams
Phoenix, AZ 85007

Utah

Department of Natural Resources
Division of Fish and Game
1596 W. North Temple
Salt Lake City, UT 84116

Nevada

Fish and Game Commission
P.O. Box 10678
Reno, NV 89510

Colorado

Colorado Department of Game, Fish, and Parks
6060 Broadway
Denver, CO 80216

Wyoming

Wyoming Fish and Game Commission
Box 1589
Cheyenne, WY 82001

Idaho

Fish and Game Department
600 S. Walnut
Boise, ID 83707

Montana

Department of Fish and Game
Helena, MT 59601

Pacific Coast States

California

California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

Student Supplement 1

Oregon	Oregon State Game Commission 1634 S.W. Alder Street Portland, OR 97208
Washington	Washington State Game Department 600 North Capitol Way Olympia, WA 98501
Alaska	Alaska Department of Fish and Game Subport Building Juneau, AK 99801

Wildlife Management
Unit 8

Assignment Sheet 1—Explain Effects on a Food Chain When Parts Are Removed

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
• Directions have been followed	______
• Explanations are logical	______
• Participated in class discussion	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: As you learned in Objective 2, a food chain is the connecting link between various organisms as they eat to survive and multiply. Food chains are a necessary part of the ecosystem. Without them, there would be no way to naturally control wildlife populations. In this assignment, you will study how the food chain is disrupted when parts are removed.

Directions: Use the following food chain consisting of five organisms. Record the results as various parts are removed. Be prepared to discuss your findings in class.

Food Chain: Grass → Grasshopper → Frog → Snake → Hawk

1. Begin by removing the hawk from the chain.

   Explain the result or change in the ecological system.

   ____

   ____

2. Replace the hawk in the chain and remove the snake.

   Explain the result or change in the ecological system.

   ____

   ____

Assignment Sheet 1

3. Replace the snake and remove the frog.

   Explain the result or change in the ecological system.

   ____

   ____

4. Replace the frog and remove the grasshopper.

   Explain the result or change in the ecological system.

   ____

   ____

5. Replace the grasshopper and remove the grass.

   Explain the result or change in the ecological system.

   ____

   ____

6. Briefly discuss what you have learned about the effects on a food chain when parts are removed?

   ____

   ____

   ____

   ____

   ____

   ____

Wildlife Management
Unit 8

Assignment Sheet 2—Create a Food Web

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Directions have been followed	______
• Ten organisms are used	______
• Organisms are correctly identified	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: The purpose of a food web is to show the interconnecting food chains in an ecosystem. From a food web, you can see how organisms depend on each other for survival. In this assignment, you will create a food web to learn more about the dependent relationship of organisms as well as their food preferences.

Directions:

1. Find pictures of ten organisms that interconnect in a food chain.
2. Cut their pictures from magazines, newspapers, or wildlife brochures.
3. Attach pictures to a white poster board in a circle to form a food web.
4. Draw arrows pointing to the consumer of each organism.
5. Identify each as producers, herbivores, carnivores, or omnivores.

Wildlife Management
Unit 8

Assignment Sheet 3—List Fish and Wildlife in Your Area

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Fifteen species are listed	______
• Species are correctly classified	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: Unless you enjoy fishing, hunting, bird watching, or taking nature walks, you probably haven't given much thought to the various wildlife that are native to the area. This assignment will provide you with an opportunity to learn about wildlife that may be found in or around your community.

Directions: Make a list of fifteen wildlife—fish, birds, and mammals—found in or around your area. Classify these wildlife by placing the proper symbol beside the species name.

U—Upland bird
W—Wetland bird
R—Raptor
L—Large mammal
S—Small mammal
F—Fish

Name	Symbol
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Assignment Sheet 3

Name	Symbol
10.	
11.	
12.	
13.	
14.	
15.	

Wildlife Management
Unit 8

Assignment Sheet 4—Identify Wildlife You See in a Certain Time Span

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
- Ten species are listed	______
- Location and time span noted	______
- Assignment is neat and legible	______
- Assignment was completed on time	______

Introduction: Wildlife varies from region to region and state to state. Some wildlife are migratory and may move as seasons change. In this assignment you will have an opportunity to learn about the types of wildlife found in your area.

Directions: Choose an area inhabited by wildlife. Note that location below. Identify the wildlife species that you see there. Continue to observe until you identify ten species. Then note the time span that it took you to observe ten species in that location.

Location ______________________ Time Span From __________ to __________

Wildlife Species Observed

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

Wildlife Management
Unit 8

Assignment Sheet 5—Compile a Profile of a Wildlife Species

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Profile is complete	______
• Information presented is accurate	______
• Report is interesting	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: Just like humans, wildlife are consumers of natural resources. They need food, water, and shelter to survive. By understanding their needs, we can minimize the dangers to wildlife populations and establish good management practices that support and protect wildlife.

Directions: Using books and periodicals from your local or school library, and articles found in on-line computer services, compile a detailed profile about a wildlife species that you have selected to study. Your profile should be one to two pages and should include the following information:

- Species of wildlife
- Description of wildlife
- Habitat requirements, including feeding and cover requirements
- Reproduction characteristics
- Role of species in the environment
- Federal legislation that protects species (if any)
- Future outlook of species
- Bibliography—Sources of information for profile

Be prepared to present a brief report of your findings in class.

Wildlife Habitats
Unit 9

Objective Sheet

Unit Objective

After completing this unit, the student should be able to distinguish among various wildlife habitats and improve wildlife habitats. The student should demonstrate these competencies by completing the assignment sheets, job sheets, and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to wildlife habitats with their definitions.
2. Match the components of a habitat with their descriptions.
3. List the objectives of wildlife habitat management.
4. Select true statements concerning habitat management principles.
5. Match common tools and techniques of habitat improvement with their uses.
6. Classify actions taken to improve wildlife habitats.
7. List causes of habitat destruction.
8. Match types of wildlife habitats with the descriptions.
9. Complete statements concerning lakes, ponds, and pothole habitats.
10. Select true statements concerning river and stream habitats.
11. Complete statements concerning wetland habitats.
12. Complete statements concerning woodland habitats.
13. Select true statements concerning rangeland habitats.
14. Select true statements concerning farmland habitats.
15. Select true statements concerning urban habitats.
16. Layout and identify ways to improve a local habitat. (Assignment Sheet 1)
17. Identify ways to improve a wetland habitat. (Assignment Sheet 2)
18. Determine the carrying capacity of a pond. (Assignment Sheet 3)

Objective Sheet

19. Determine the carrying capacity of a rangeland habitat. (Assignment Sheet 4)

Advanced Applications (Optional)

1. Survey non-game birds at a feeding station. (Assignment Sheet 1A)
2. Survey wildlife foods. (Assignment Sheet 2A)
3. Survey for wildlife signs. (Assignment Sheet 3A)
4. Develop a management plan for a farm pond for sport fishing. (Assignment Sheet 4A)
5. Analyze current reports concerning wildlife habitats. (Assignment Sheet 5A)
6. Construct nesting sites. (Job Sheet 1A)
7. Increase hummingbird habitat. (Job Sheet 2A)

Wildlife Habitats
Unit 9

Information Sheet

1. **Terms and definitions**

   a. **Algae**—Simple, free-floating water plants

   Note: These form the base of the food chain in aquatic habitats.

   b. **Aquatic**—Growing or living in or upon water

   c. **Biomass**—The amount of living matter (plants and animals) in a given habitat

   d. **Buffer strip**—An area that divides two areas of differing habitat

   e. **Browse**—The leaves, shoots, and twigs of trees and shrubs available for animal consumption

   f. **Canopy**—Leaf area of the woodland

   g. **Carrying capacity**—The maximum number of animals that an area can support

   h. **Edge**—The transitional zone where one cover type ends and another begins

   i. **Forb**—A general name for any fleshy-leafed plant, other than grass, which is found in grasslands and open woodlands

   j. **Habitat**—The area where a plant or animal naturally lives and grows

   k. **Home range**—The area in which an animal lives and travels

   l. **Limiting factors**—Factors that restrict the population potential of a species

   m. **Mast**—Nuts of trees and shrubs (such as oak, hickory, and beech) which are used as food by animals

   n. **Plankton**—Suspended, floating, microscopic plants and animals in the water

   o. **Release cut**—Thinning of old shrub growth to allow new growth

   p. **Riffles**—A shallow area in a stream that causes broken water

   q. **Riparian land**—The area along the bank of a natural watercourse

   r. **Spawning**—The process by which fish deposit eggs

   s. **Succession**—The progressive development of vegetation which replaces one plant community with another in order to reach a climax condition

   t. **Territory**—The area an animal will defend

Information Sheet

2. **Components of a habitat**

   a. **Food**—Provides nutrients for growth, maintenance, and reproduction

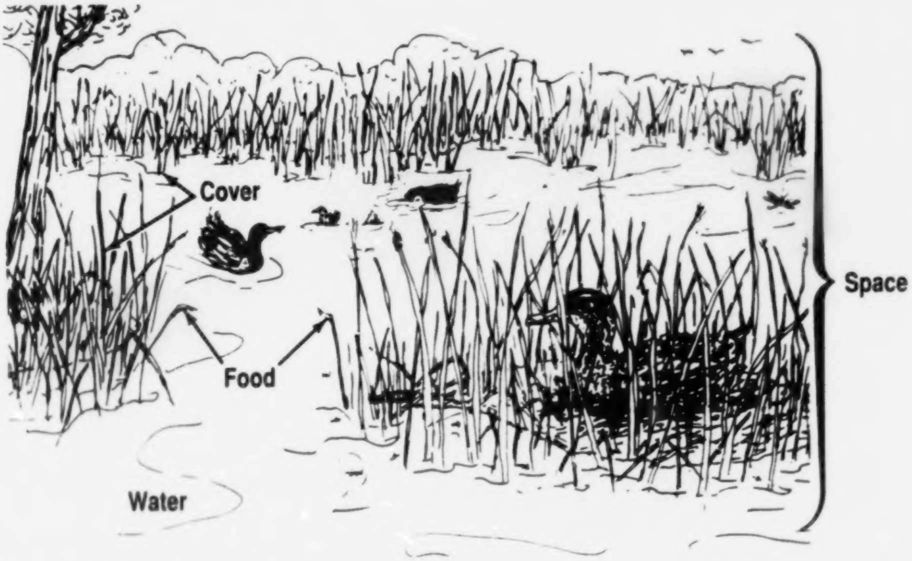
   b. **Water**—Needed for blood composition, to regulate body temperature, and to provide nutrient transport throughout the body

   c. **Cover**—Vegetation and other material providing protection for the animal

   - Conceals the nest
   - Helps to hide the young
   - Provides resting area
   - Allows escape from predators
   - Protects from adverse environmental conditions

   d. **Space**—Amount of area that an animal uses to locate its food, water, and cover (home range)

   Note: Space requirements vary according to the animal, season of the year, and quality of the habitat.



3. **Objectives of wildlife habitat management**

   a. To maintain a quality habitat as it exists in a natural ecosystem

   b. To improve a habitat where it has deteriorated or where a specific habitat component is lacking

Information Sheet

4. Habitat management principles

a. Wildlife research helps to determine the habitat requirements of specific wildlife.

b. The specific habitat needs of a species vary in some degree from those of every other kind of species.

c. Some species need a highly specialized type of habitat

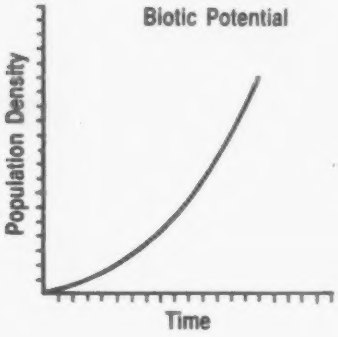
d. When the basic components of a habitat are abundant and ideal, the animal species will reach its maximum potential (biotic potential).

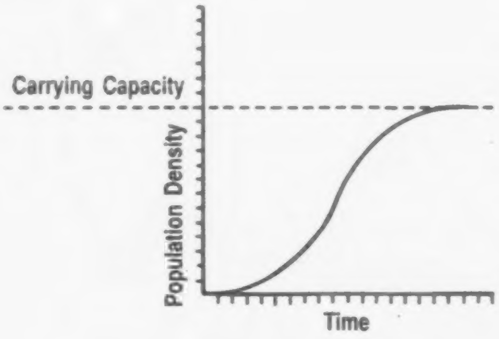
Note: Some species such as rabbits and mice have high biotic potentials, whereas, other species such as grizzly bears and bald eagles have low biotic potentials.

e. However, species rarely reach their potential because there is almost always an environmental factor that limits the population.

Examples of limiting factors:	Shortage of food or water, limited space, inadequate cover

f. Each area of land (habitat) has a certain capacity for the number of animals of any one species that it can support. This is called its carrying capacity.





g. When the population in a habitat exceeds the carrying capacity, surplus animals must either move or die.

h. When habitat conditions change, the type and amount of wildlife present may also change.

i. Wildlife species can be maintained only by providing suitable habitats.

j. When habitats are damaged or destroyed, wildlife are threatened and can become endangered or extinct.

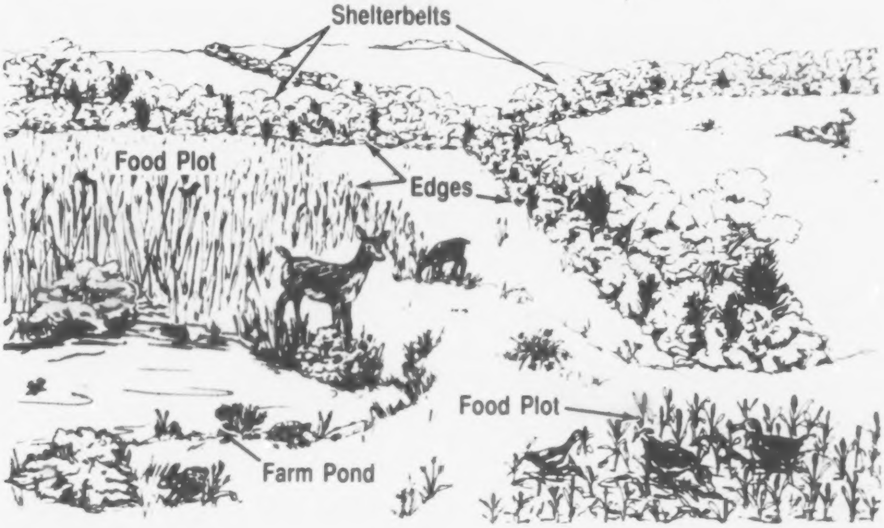
5. **Common tools and techniques of habitat improvement**

   a. **Food plots**—Planted to provide food and cover habitat

   b. **Shelterbelts**—Planted to provide escape cover, as well as protection for soil from wind erosion

   c. **Farm ponds**—Provide a habitat for fish as well as a watering place for other wildlife

   d. **Edges**—Established to provide a change between types of cover



   e. **Nesting structures**—Provide nesting places for species whose natural habitat has been damaged

   Note: Wood ducks were endangered until nesting boxes were provided for them. Now they are an abundant species in most flyways.

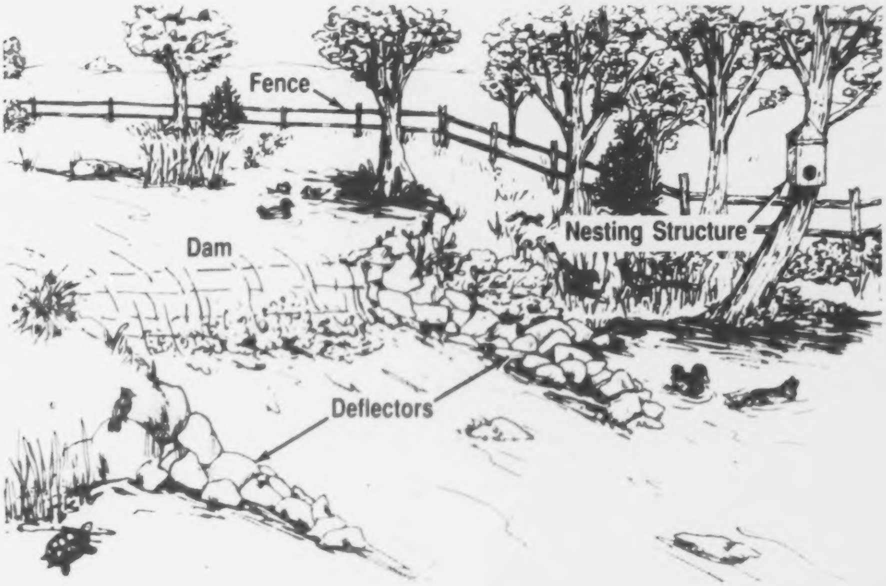
   f. **Dams**—Constructed in a stream to store water for fish and wildlife

   g. **Deflectors**—Used to control the direction of stream flow

Information Sheet

h. **Fences**—Used to protect water and its bank from contamination or damage by domestic animals

Note: By fencing cattle out of riparian zones, one can protect stream beds and pond banks for wildlife.



i. **Heavy equipment**—May be used in the removal of unwanted aquatic vegetation from some lakes, or in reshaping land for various wildlife needs

j. **Chemicals**—Used to change the chemical composition of the water or soil either to encourage or discourage various plant and animal species

Example: Rotenone is used to control unwanted fish populations by temporarily removing oxygen from the water. As "stunned" fish float to the surface, they can be collected and removed from the body of water.

6. **Ways to improve wildlife habitats**

a. Food

- Increase mast or fruit production.
- Plant shrubs and trees for browse.
- Plant food plots of grasses and legumes.
- Provide aquatic plant vegetation.

Information Sheet

b. Water

- Deepen existing water-holding basins.
- Trench runoff water into basins.
- Improve springs and water seeps.
- Build dams.
- Add tanks, troughs, or wells.
- Prevent water pollution.
- Create potholes.
- Control water levels.

c. Cover

- Provide protective cover.
  - — Plant trees and shrubs.
  - — Build brush piles.
  - — Build artificial covers (roosts, reefs).
  - — Renovate and reseed eroded areas.
  - — Seed bare land areas.
- Provide nesting cover.
  - — Protect from excessive grazing, fires, and mowing during nesting periods.
  - — Maintain existing dens or nesting trees.
  - — Provide artificial nest structures.

7. **Causes of habitat destruction**

a. Overgrazing

b. Mining

c. Construction

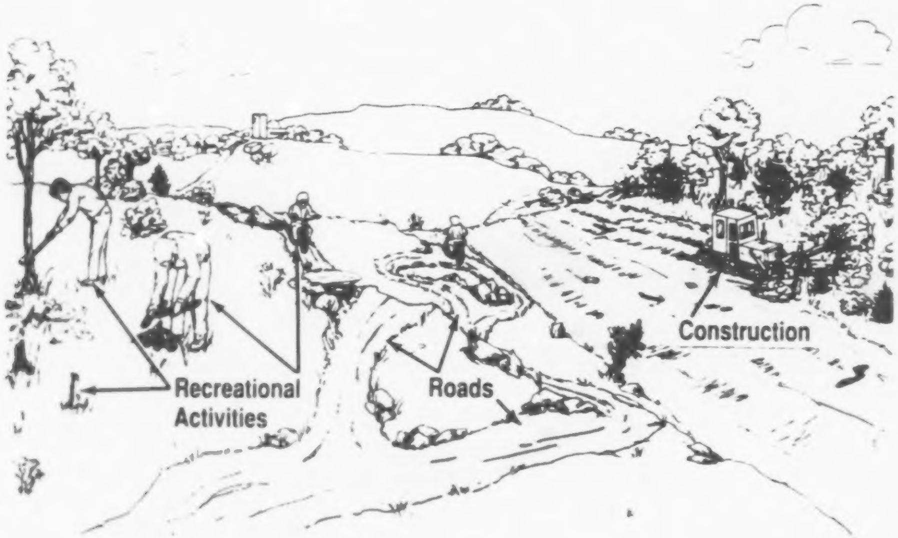
d. Logging

Information Sheet

e. Roads

f. Chemicals

g. Recreational activities



8. **Types of wildlife habitats**

   a. **Lakes, ponds, and potholes**—Bodies of still water

   b. **Rivers and streams**—Bodies of running water

   c. **Wetland**—Land where the water table is usually at or near the surface or the land is covered by shallow water

   d. **Woodland**—Land used primarily for growing trees and shrubs; includes forests, shelterbelts, and hedge rows

   e. **Rangeland**—Land where natural vegetation is mostly grasses, forbs, and shrubs

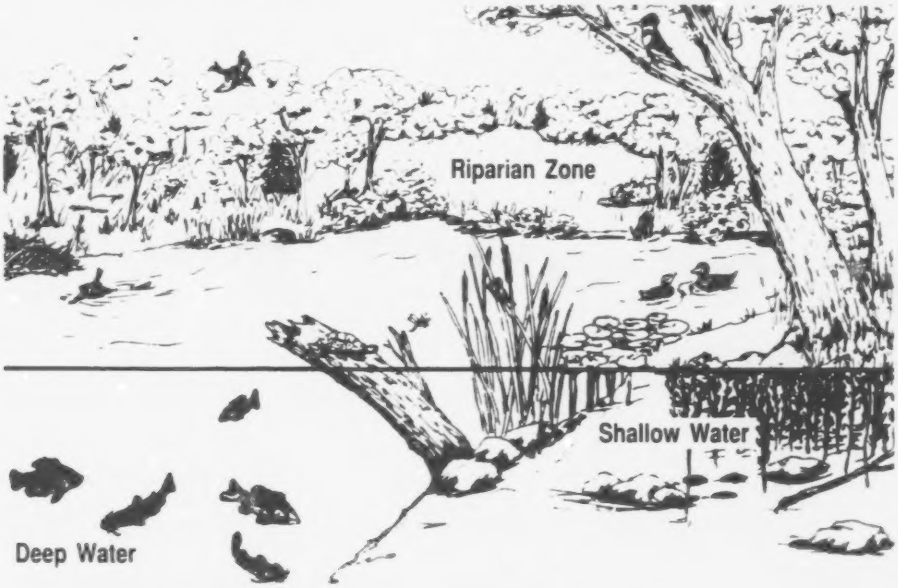
   f. **Farmland**—Land used for agricultural practices

   g. **Urban**—Land predominantly occupied by man-made structures used for residential, commercial, and industrial purposes

9. Lakes, ponds, playa lake, and pothole habitats

a. Components

- Deep water—Supports plankton and carnivorous fish
- Shallow water—Supports aquatic vegetation and diverse aquatic populations
- Riparian zone—Area located on the bank; supports both aquatic and terrestrial (land) plants and animals



b. Protecting lakes, ponds, and pothole habitats

- Fence shoreline to control livestock grazing and watering.
- Control erosion in the watershed.
- Reduce sediment draining into the lake by providing a sediment basin for all feeder streams.
- Control weeds in shallow areas.

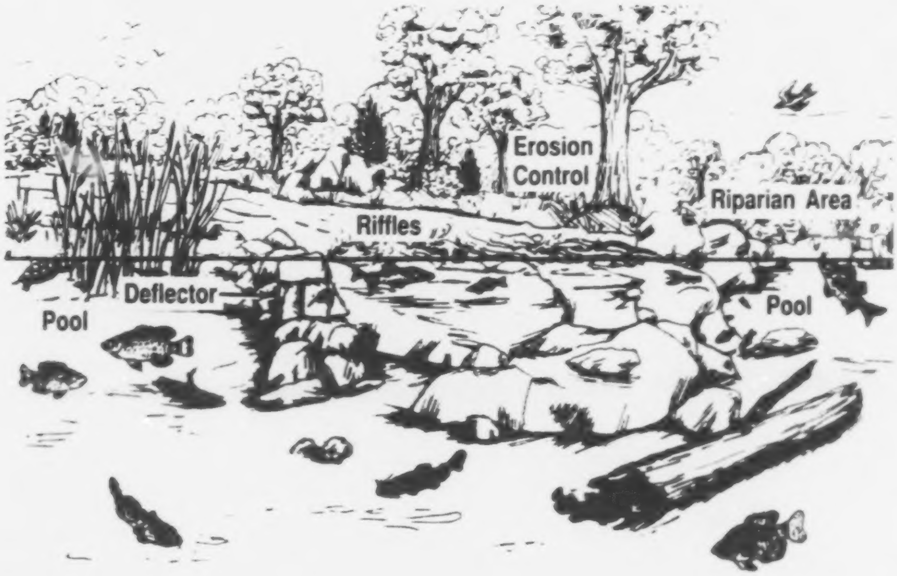
10. River and stream habitats

a. Components

- Streamflow pattern—A continuous flow of water with moderate spring runoff is best.
- Instream flow—A certain amount of water is needed to maintain stream habitat.

Information Sheet

- Streambank stability—Eroding streambanks allow sediment to ruin the streambed.
- Riffles—These provide food and spawning areas for fish, and hunting areas for predators such as racoons and bears.
- Pools—Resting areas and shelter are needed for fish to survive.
- Streambed—Area provides habitat for fish egg incubation.
- Stream width/depth—Narrow, deep streams increase available habitat for fish.
- Water temperature—A cooler temperature allows for more dissolved oxygen for fish.
- Riparian area—Area near riverbanks provides a breeding ground for insects used as food for fish.



b. Protecting river and stream habitats

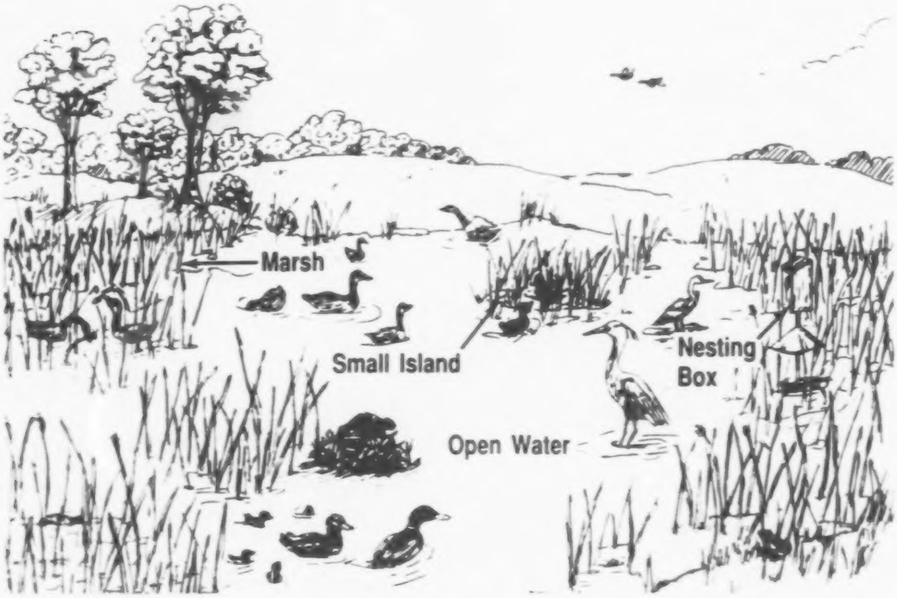
- Fence to protect from livestock grazing and watering.
- Control erosion in the watershed to reduce silting into stream or river.
- Control streambank erosion by planting trees and shrubs and by placing rocks and stones along the edge.
- Remove debris lodged on inside curves of the stream that restrict water flow.
- Use deflectors to create natural pools.

Information Sheet

11. Wetland habitats

a. Components

- Potholes, playa lakes, and marsh—An ideal wetland is one-third open water and two-thirds marsh.
- Plant communities—The high concentration of nutrients in wetlands helps to increase the productivity of vegetation.
- Size—Larger wetland areas tend to provide more diverse habitat for more types of wildlife.
- The level of water usually fluctuates seasonally which will affect the type and number of wildlife at those times.



b. Protecting wetland habitats

- Provide a dependable water supply.
- Control water levels.
- Protect area from too much grazing that can destroy valuable food and cover.
- In wetlands that are overgrown, provide open areas by removing vegetation in 50-foot wide strips.

- Provide nesting and resting sites.

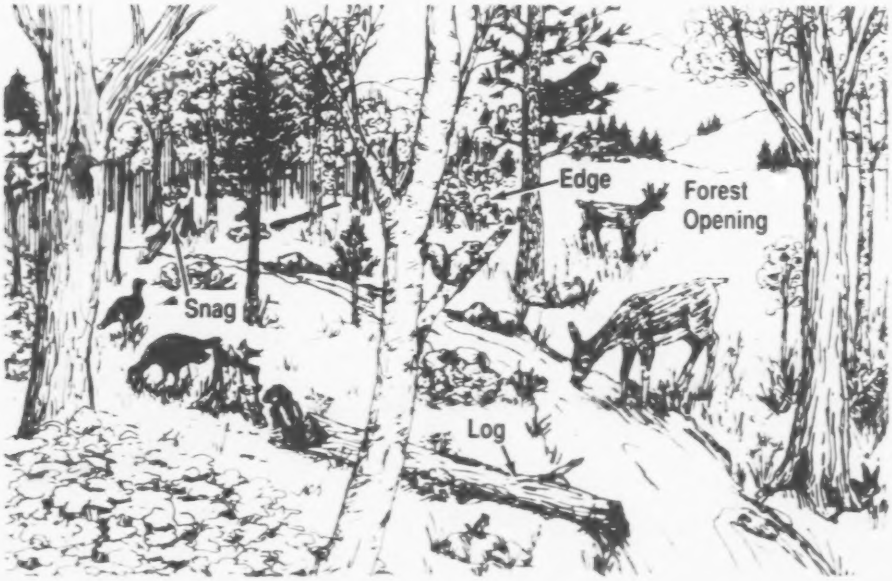
  Examples: Sandbars, small islands, anchored floating logs, rock piles, old bales, nesting boxes

- Plant desirable vegetation.

12. Woodland habitats

a. Components

- Trees—Deciduous and evergreen trees of various ages and sizes
- Snags—Dead or partly dead trees
- Logs—Dead trees or portions of trees lying on the forest floor
- Edges—Preferred by large numbers of wildlife
- Forest openings—Areas that do not support trees but provide a source of diversity within the forest



b. Protecting woodland habitats

- Protect from unwanted fire.

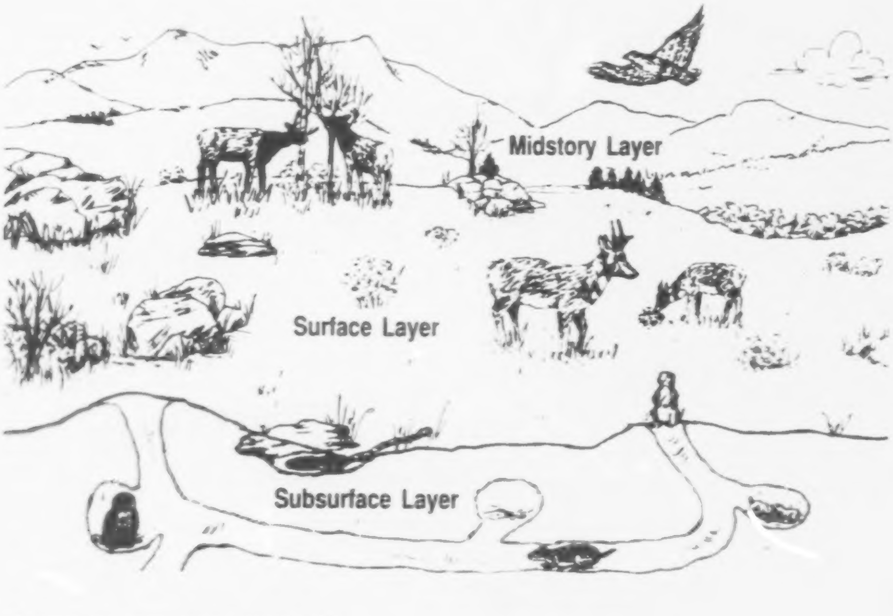
  Note: Prescribed and controlled fires can aid in maintaining proper wildlife habitat by renewing forest growth and providing "edges" for numerous species' habitat.

- Protect from overgrazing.
- Selectively cut trees.
- Leave den trees when cutting hardwood timber.
- Pile brush near the edge of the woods.
- Release cut to increase production of nuts and other tree seeds useful to wildlife.
- Cut trees out of woodland edges to increase the growth of shrubs for food and cover.

13. Rangeland habitats

a. Components

- Subsurface layer—Includes the area suitable for burrow or tunnel construction
- Surface layer—Includes short, mid, and tall grass species
- Midstory layer—Includes deciduous and evergreen shrubs



b. Protecting rangeland habitats

- Protect from unwanted fires.

  Note: Prescribed burns help prevent succession to species such as red cedar, mesquite, shinnery oak, etc.

Information Sheet

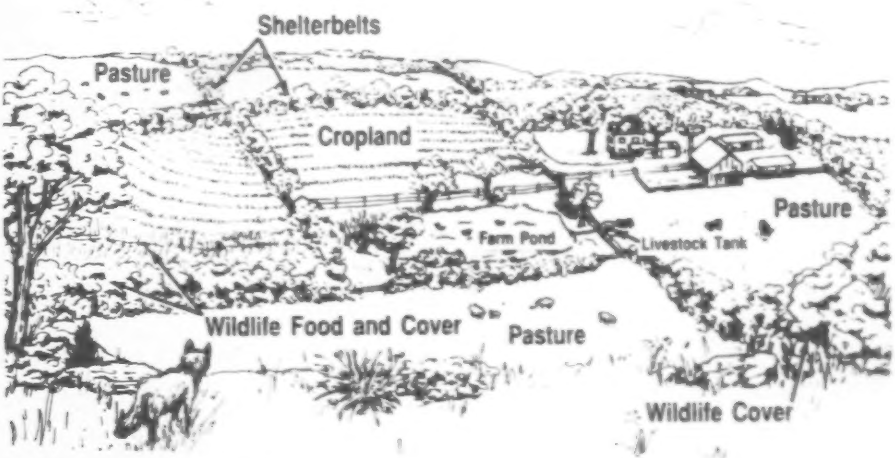
- Protect from overgrazing.
- Reseed and renovate grasses.
- Construct walkways in marshy rangeland.
- Remove only part of the brush and shrubs.
- Fertilize to increase plant growth.

  Note: In native prairie areas, fertilizer will increase growth of forbs—to the detriment of native grass species which do not respond well to additional fertilizer.
- Provide areas for watering.
- Provide salt.

14. **Farmland habitats**

    a. Components

    - Cropland
    - Pasture
    - Shelterbelts



    b. Protecting farmland habitats

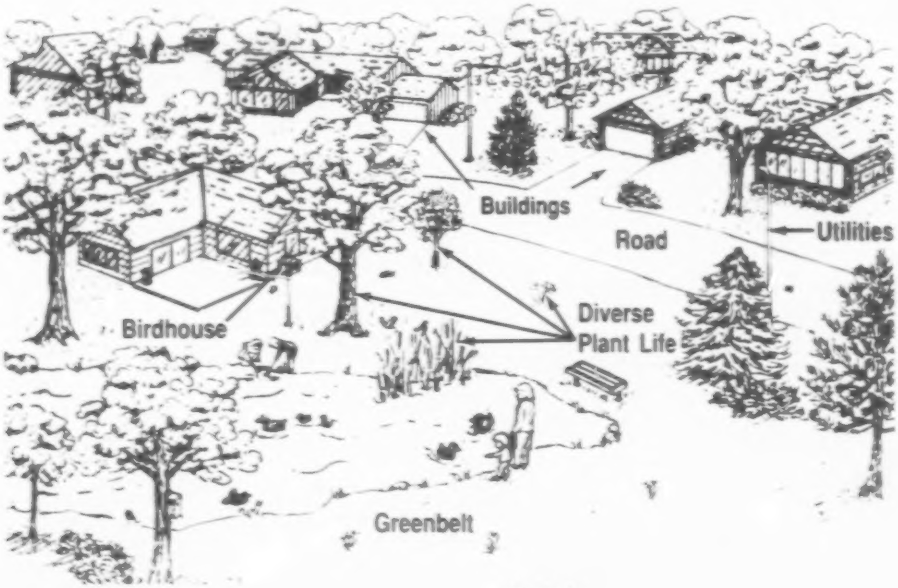
    - Provide wildlife with habitat areas so they do not reduce crops meant for production.
    - Protect wildlife areas from grazing by domestic animals.
    - Plant trees and shrubs for cover and food.
    - Maintain a source of water.

- Perform good land management practices that prevent soil erosion.
- Provide shelterbelts for erosion control and wildlife habitat.
- Seed marginal lands to grasses.
- Provide food or cover plots.
- Construct farm ponds.
- Control burning.
- Prevent overgrazing of pastures.
- Restrict clean mowing of pastures and fence rows.
- Evaluate removal of brush.

15. Urban habitats

a. Components

- Buildings
- Landscaped areas and lawns
- Utilities
- Transportation (roads and vehicles)
- Natural areas such as parks, greenbelts, and undeveloped areas
- People and pets



Information Sheet

b. Protecting urban habitats

- Plant trees and shrubs of diverse species preferred by wildlife for food and cover, especially on edges of property.

  Note: Plantings with greater diversity will attract more kinds of wildlife.

- Provide steady water sources at ground level.
- Use chemicals (fertilizers and pesticides) conservatively and according to label directions.
- Provide bird houses, feeders, and baths.
- Restrict free roaming pets.
- Use greenbelts (undisturbed areas) in new urban developments to provide areas for wildlife.

Wildlife Habitats
Unit 9

Assignment Sheet 1—Layout and Identify Ways to improve a Local Habitat

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Design is accurate	______
• Improvements are appropriate	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: Even in the most urbanized setting, there is a certain amount of wildlife, whether it be birds, small rodents, fish, or amphibians. So, too, any setting can be improved to favor the species present by improving natural cover and food and water resources. This assignment will help you become aware of things you can do in your local surroundings to improve natural habitat for wildlife species already present, and activities in which you can engage to attract additional species to your area.

Directions: Draw the layout for either your school and school grounds or your home and surrounding grounds or land. Add details to your plan of ways to improve that habitat to attract wildlife. Remember the four basic components of a habitat. You may need to research about the wildlife you are trying to attract to find out what they like and need in their habitat.

Wildlife Habitats
Unit 9

Assignment Sheet 2—Identify Ways to Improve a Wetland Habitat

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Answers reflect cognitive grasp of information	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: Wetlands are a prime source of food, water, and cover for many wildlife species. As with most habitats, however, some improvements can be made to enhance the carrying capacity of most wetlands—either through maintenance and protection, or physical changes such as removing excess plant growth etc. to provide "edges" and open space. This assignment asks you to identify ways to improve various wetland "problems."

Directions: Using the information presented in this unit, determine the proper improvements to be made to the following wetland habitat conditions.

1. The wetland is dry part of the year.

   ____

   ____

2. The wetland receives excess flooding during the spring.

   ____

   ____

3. Grazing livestock are polluting the area.

   ____

   ____

4. Part of the wetland is overgrown with no open water.

   ____

   ____

Wildlife Habitats
Unit 9

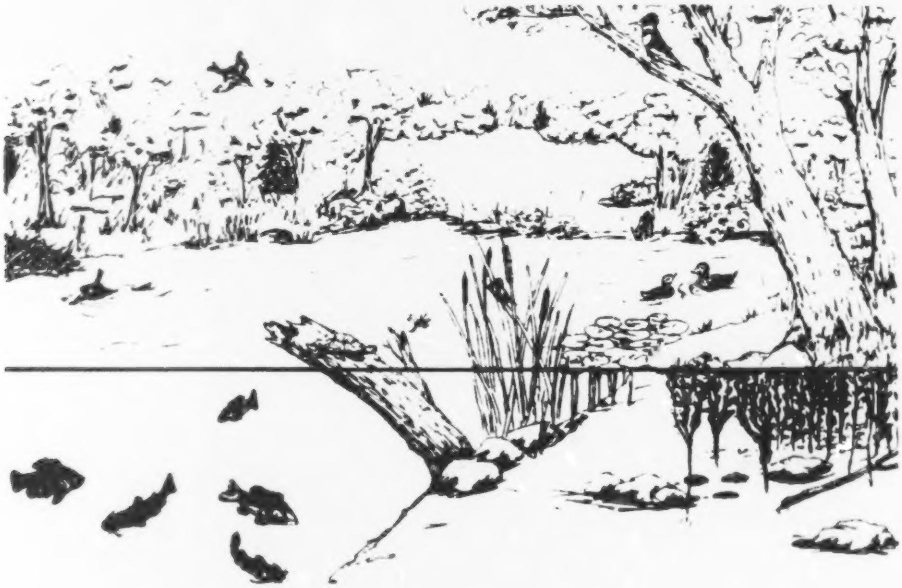
Assignment Sheet 3—Determine the Carrying Capacity of a Pond

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Calculations are accurate	______
• Assignment was completed on time	______

Introduction: Every pond has a physical limitation of the amount of biotic activity it can sustain. This limit is fixed, regardless of the species living in the pond. So, through this exercise you will gain an awareness of the differing amounts of certain species a given pond will sustain.

Directions: Using the information provided, determine the amount of each fish that a pond might support.



Assignment Sheet 3

The bluegill population that this pond can support is 200 lbs. per acre. Consider that the amount of food, cover, and space remain the same.

1. The same pond can support only $\frac{1}{4}$ the amount of bass. The capacity of the pond for bass is ____________________ pounds per acre.

2. The same pond can support only $\frac{1}{20}$ the amount of northern pike. The capacity of the pond for northern pike is ____________________ pounds per acre.

3. Theoretically, the pond can support more, but smaller, bluegills. If the pond supports two hundred 1-pound bluegills, it should be able to support ____________________ $\frac{1}{2}$-pound bluegills.

Wildlife Habitats
Unit 9

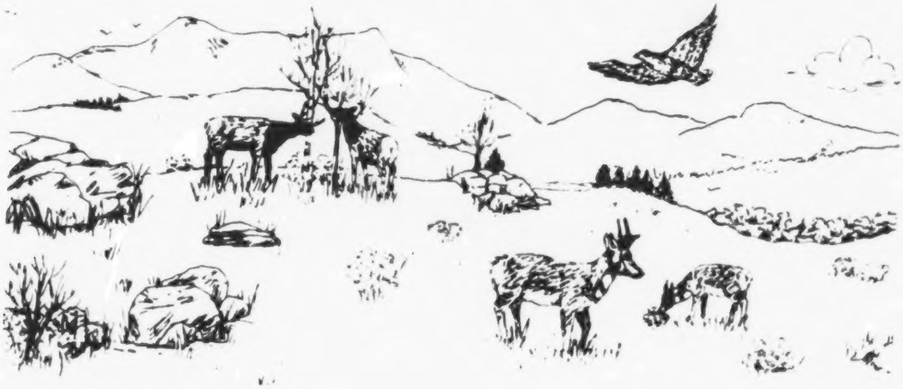
Assignment Sheet 4—Determine the Carrying Capacity of a Rangeland Habitat

Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
• Calculations are accurate	______
• Assignment was completed on time	______

Introduction: Rangeland stores energy from the sun in various grasses and forbs. Animals harvest that energy by grazing the grasses. Still, a given acreage of rangeland will support only so many of any given species of grazing animal. This exercise will illustrate the difference in a range plot's carrying capacity—or its ability to support given species.

Directions: Using the following information, determine the carrying capacity of a rangeland habitat.



This rangeland has the capacity to support 100 cows.

Livestock to wildlife ratios
1 cow = 1 buffalo = 2 elk = 3 deer = 4 bighorn sheep = 4 antelope

Assignment Sheet 4

1. What is the capacity of the range for buffalo? ______
2. What is the capacity of the range for elk? ______
3. What is the capacity of the range for deer? ______
4. What is the capacity of the range for bighorn sheep? ______
5. What is the capacity of the range for antelope? ______

Outdoor Recreation
Unit 10

Objective Sheet

Unit Objective

After completing this unit, the student should be able to evaluate a local outdoor recreation site and plan and design a new outdoor recreation area. The student should demonstrate these competencies by completing the assignment sheets and job sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to outdoor recreation with their definitions.
2. List outdoor recreation activities and the equipment and facilities needed for each.
3. State the skills and licenses needed for outdoor recreation activities.
4. Select from a list the major factors increasing the demand and participation in outdoor recreation.
5. Select true statements concerning other factors affecting current and future participation in recreational activities.
6. List considerations when selecting an outdoor recreation area.
7. List reasons why people participate in outdoor recreation.
8. Select from a list agencies responsible for public lands, recreation areas, and employment in outdoor recreation.
9. List employment opportunities in outdoor recreation.
10. List business opportunities in outdoor recreation.
11. Identify outdoor recreation activities and facilities available locally. (Assignment Sheet 1)
12. Make a presentation about an outdoor recreation activity. (Assignment Sheet 2)
13. Interpret graphs on future trends in outdoor recreation. (Assignment Sheet 3)
14. Evaluate a local outdoor recreation site. (Assignment Sheet 4)
15. Plan and design a new outdoor recreation area. (Assignment Sheet 5)
16. Research local employment opportunities in outdoor recreation. (Assignment Sheet 6)

Objective Sheet

Advanced Applications (Optional)

1. Develop a historical presentation for visitors to your area. (Assignment Sheet 1A)
2. Evaluate conflict resolution scenarios. (Assignment Sheet 2A)
3. Give accurate, easy-to-follow directions. (Assignment Sheet 3A)
4. Locate constellations in the night sky. (Assignment Sheet 4A)
5. Analyze current reports concerning the growth of outdoor recreation and its effects on the environment. (Assignment Sheet 5A)
6. Build a wood-conserving Dakota Fire Hole. (Job Sheet 1A)

Outdoor Recreation
Unit 10

Information Sheet

1. **Terms and definitions**

   a. **Concessions**—The right to sell food, supplies, or equipment at a park or event

   b. **Convenience**—Something that makes work easier

   c. **Cultural event**—Events or programs which train and refine the mind

   d. **Demand**—The desire for something, together with the ability to pay for it

   e. **Disposable personal income (DPI)**—Income above what is needed to buy life's necessities

   f. **Facility**—A structure or convenience which allows something to be done more easily or enjoyably

   g. **Leisure**—Unoccupied time during which one may indulge in rest or recreation

   h. **Life expectancy**—The average age at which people die

   i. **Motivation**—An inner drive (need or desire) that causes one to act in a certain way

   j. **Recreation**—Activity that refreshes or restores a person's strength and spirit after work

   k. **Rest**—Free from work or activity

   l. **Scenic**—View or landscape having natural beauty

   m. **Statistics**—Facts of a numerical kind

   n. **Stress**—Tension, strain, or force exerted upon a body

   o. **Terrain**—Tract of ground, especially in regard to its features or fitness for some use

   p. **Tourism**—Industry of attracting tourists to a given location

   q. **Trend**—The general tendency of a course of events

   r. **Unique**—One of a kind or distinctive

Information Sheet

2. Equipment and facilities needed for outdoor recreation activities

Activity	Equipment	Facility
Archery	Bows, arrows, proper clothing	Archery range, public or private hunting area
Biking	Bicycle, helmet	Bike trails, safety signs
Bird watching	Binoculars, camera, bird books	Natural habitats for birds
Boating	Motor or sail boat	Lake or large river
Camping	Tent or trailer, cookware, lights, proper clothing	Table, grill, trash disposal, clean, scenic uncrowded area
Canoeing	Canoe, life jacket, paddles	Stream or lake
Fishing	Fishing pole, reel, bait	Lake, stream, or farm pond
Four-wheeling, ATV	Four-wheel-drive vehicle or other all-terrain vehicle	Rough or challenging terrain, dry stream beds
Golfing	Golf equipment	Golf course, driving range, or miniature golf course
Hang gliding	Hang glider	Steep terrain, dependable air currents
Hiking	Shoes, pack, food, maps	Hiking trails, scenic area
Horseback riding	Horse, riding gear (tack)	Barns, corrals, riding area
Hunting	Gun, ammunition, proper clothing	Private hunting area with permission or public hunting area
Jogging/walking	Proper shoes and clothing	Trails or tracks
Lawn games such as volleyball, badminton	Game equipment	Small open, uncrowded areas
Picnicking	Food, table	Shaded, scenic area, clean, free of pests
Rock/mountain climbing	Proper clothes, climbing equipment	Public/private climbing area
Scuba diving	Diving equipment, boat	Clear lake, ocean, or stream
Sight-seeing	Private vehicle or bus	Scenic turn-outs, information signs
Snow skiing	Skies, boots, proper clothing	Mountainous area, heavy snowfall
Surfing	Surfboard or sailboard	Coastal areas or lakes
Swimming	Life vest, "buddy"	Indoor or outdoor swimming area
Tennis	Tennis racquet, balls, shoes	Tennis court
Water skiing	Skies, boat, ski rope, life vest	Lake or large river

Information Sheet

3. Skills and licenses needed for outdoor recreation activities

Activity	Skills	License/Permit/Certification
Archery	Knowledge of equipment, safety	None
Biking	Biking techniques, safety	Bike license required in some states
Bird watching	Knowledge of species and habitats	None
Boating	Boat operation, safety	Boat, motor, trailer license
Camping	Tent pitching, fire building	Permits at some locations
Canoeing	Paddling, safety	Canoe license in some states
Fishing	Technique	Fishing license or permit
Four-wheeling, ATV	Performance capability, safety	License required in some states
Golfing	Technique	Usually a fee is required
Hang gliding	Coordination, safety	Certification from hang gliding school
Hiking	Map reading, physical fitness	None
Horseback riding	Saddling, caring for a horse, safety	None
Hunting	Knowledge of the outdoors, safety	Hunting license
Jogging/walking	None	None
Lawn games such as volleyball, badminton	Various techniques	None
Picnicking	None	None
Rock/mountain climbing	Climbing techniques, safety	Certain areas require permits
Scuba diving	Swimming, safety	Scuba diving certificate
Sight-seeing	Map reading	None
Snow skiing	Balance, technique, endurance, safety	None, a fee may be required
Surfing	Balance, safety	None
Swimming	Swimming technique, safety	None, a fee may be required
Tennis	Balance, technique, endurance	None
Water skiing	Balance, technique, safety	None

4. Major factors increasing the demand and participation in outdoor recreation

a. **Leisure time**—As leisure time increases, participation in outdoor recreation increases.

b. **Income**—As individual income increases, the ability to pay for outdoor recreational equipment, area-use fees, transportation, and facility fees also increases.

c. **Mobility**—The ability of an individual to travel freely influences the participation in outdoor recreational activities. The automobile, available to most Americans, is the principal means of transportation to recreational destinations.

Information Sheet

5. Other factors affecting current and future participation in recreational activities

a. **Age**—More Americans are retiring at an earlier age. Less than 1 in 4 wait until age 65 to retire.

- Life expectancy is increasing because of better health care and environmental conditions.
- Early retirement and increased life expectancy increases leisure time for senior citizens resulting in a greater demand for outdoor recreation facilities.

b. **Disposable personal income (DPI)**—Has decreased in the past 20 years.

Note: Recently the share of DPI going to recreation was 6.4%.

c. **Physical disability**—56% of people with physical disabilities are limited by mobility which prevents their participation in outdoor recreation. As accommodations for the physically challenged improve, participation in outdoor recreation will follow.

d. **Women**—As more women join the work force, advance toward economic equity, and have more leisure time, they will be more active in outdoor recreation and will likely become leaders in recreational activity trends.

6. Considerations when selecting an outdoor recreation area

Note: These are listed in rank order.

a. Natural beauty (An area with outstanding scenic qualities)

b. Amount of crowding

Note: Many people travel to recreational areas to get away from crowds.

c. Sanitation facilities (clean and convenient)

d. Parking availability

e. Available information (information centers, brochures, signs)

f. Picnic areas (clean and convenient)

g. Cultural events

h. User fees

Note: Fees are used primarily to improve facilities, but can be instrumental in reducing overcrowding.

i. Concessions

j. Organized sports or competitive events

k. Guided activities

Information Sheet

7. Reasons why people participate in outdoor recreation

Note: These are grouped to show percentage of composition.

Reason	Percentage
Fitness • To obtain or maintain good health from physical exercise • To enjoy fresh air and sunshine • To reduce stress • To lose weight	10%
Social • For relaxation with other people • To be with friends • To make friends • So the family can be together • To have fun	33%
Excitement • To break the monotony of daily routines • For competition in outdoor recreation activities • For excitement in doing unusual things • To experience the risk and danger involved • To develop new skills	16%
Experience self and nature • To be alone • To experience nature • To view the scenery • To test self endurance, limitations, and character • To watch wildlife	33%
Conformist • Because everyone else is doing it • To get away from a cramped environment	8%

8. Agencies responsible for public lands, recreation areas, and employment in outdoor recreation

a. U.S. National Park Service

b. U.S. Forest Service

c. U.S. Army Corps of Engineers

d. U.S. Bureau of Reclamation

e. U.S. Bureau of Land Management

Information Sheet

f. U.S. Fish and Wildlife Service

g. State park services

h. State recreation and tourism departments

i. State fish and game departments

j. Regional, county, and city parks

k. Private recreational areas

l. Private recreational businesses

9. **Employment opportunities in outdoor recreation**

a. Business management—Managing a business

b. Entertainment—As applied to outdoor recreation, this would be in the form of nature programs, outdoor plays, or musical entertainment

c. Enforcement—As a park ranger, lake ranger, or game warden, conflict resolution

d. Equipment operation—Truck drivers or operators of tractors, chain saws, lawn mowers, string trimmers, water pumps, and electric motors

e. Ground care—Landscaping, grass trimming, camp site cleaning, trail building and facility repair

f. Guide service—Hunting or fishing guide, hiking guide, canoeing and rafting, horseback riding, and sight-seeing

g. Instruction—Golf, hang gliding, scuba diving, surfing, wind surfing, swimming, tennis, snow and water skiing

h. Recreation manager—Managing a recreational area or activity

i. Rental—Paying for the use of recreational equipment

j. Safety—The instruction of safety procedures or first aid

k. Sanitation—Maintaining the sanitary facilities such as garbage, restrooms, pest control, trailer dump facilities, and general cleanliness

l. Wildlife management—Control and improvement of wildlife numbers

Information Sheet

10. Business opportunities in outdoor recreation

a. Contractual
- Grounds care
- Landscaping
- Sanitation

b. Bait shop

c. Dude ranch

d. Equipment maintenance

e. Equipment sales

f. Fish farms

g. Guide service
- Hunting
- Fishing
- Hiking
- Canoeing/rafting
- Horseback riding/pack train
- Rock/mountain climbing
- Scuba diving
- Sight-seeing

h. Hunting preserve

i. Instruction and sales

j. Excursion boat

k. R.V. campground

l. Equipment rental

m. Sporting good store

n. Travel agent

o. Youth camp

Outdoor Recreation
Unit 10

Assignment Sheet 1—Identify Outdoor Recreation Activities and Facilities Available Locally

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
• Ten local outdoor recreation areas are listed	______
• Facilities are correct for each	______
• Questions are answered appropriately	______
• Assignment was completed on time	______

Introduction: Every community whether rural, suburban or urban, has access to some forms of outdoor recreation. This exercise is designed to make you aware of the part outdoor recreation plays in your local area. By cataloging outdoor recreation within a 30 mile radius of your home, you can begin to see the recreational and economic potential such activities have for you and your community.

Directions: List ten (10) outdoor recreation activities that are available to you within thirty miles of your home. Also describe the facilities available for each. Then answer the questions that follow.

Local Outdoor Recreation Activities	Facilities Available

Assignment Sheet 1

1. Of the outdoor recreation activities listed above, which ones do you participate in?

 ____

2. How often do you participate in them? ________________________

 ____

3. What outdoor recreations do you think you would like, but you have never tried?

 ____

4. What outdoor recreations are not available locally? ____________________

 ____

5. Are there any outdoor recreations that are available locally, but that are too crowded or too expensive for you? ________________________________

 ____

Outdoor Recreation
Unit 10

Assignment Sheet 2—Make a Presentation About an Outdoor Recreation Activity

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Presentation was well planned, informative, and interesting	______
• Length was 5-10 minutes	______
• Spoke in a clear, concise manner	______
• Used appropriate eye contact, gestures, and posture	______
• Used visual aids effectively	______

Introduction: Outdoor recreation provides many opportunities for fun, profit, and improved mental and physical health. Consequently, many forms of outdoor recreation carry with them risks of injury, etc. Select an activity related to outdoor recreation and make an oral presentation concerning it. In this manner, you will not only learn more about outdoor recreation, but you will teach others about the benefits and precautions related to such activity.

Directions: Choose an outdoor recreation activity and then prepare a 5-10 minute presentation on your activity. The presentation may be one of the following:

- Oral presentation to class/instructor with at least one visual aid such as tools or equipment used for activity, slides about activity, poster of safety rules, etc.
- Videotape presentation about your activity

Presentation Suggestions

1. Proper use of the special equipment needed for a particular outdoor recreation activity
2. Safety demonstration for a particular outdoor recreation activity
3. First aid demonstration
4. Your favorite outdoor recreation activity, why you like it, and what skills and equipment are involved

Outdoor Recreation
Unit 10

Assignment Sheet 3—Interpret Graphs on Future Trends in Outdoor Recreation

Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
• Answers are correct	______
• Assignment was completed on time	______

Introduction: Statistics abound in all areas of life. The compilation of statistics gathered through surveys and research projects is usually displayed graphically for easy interpretation. This exercise will enhance your ability to read and interpret graphs.

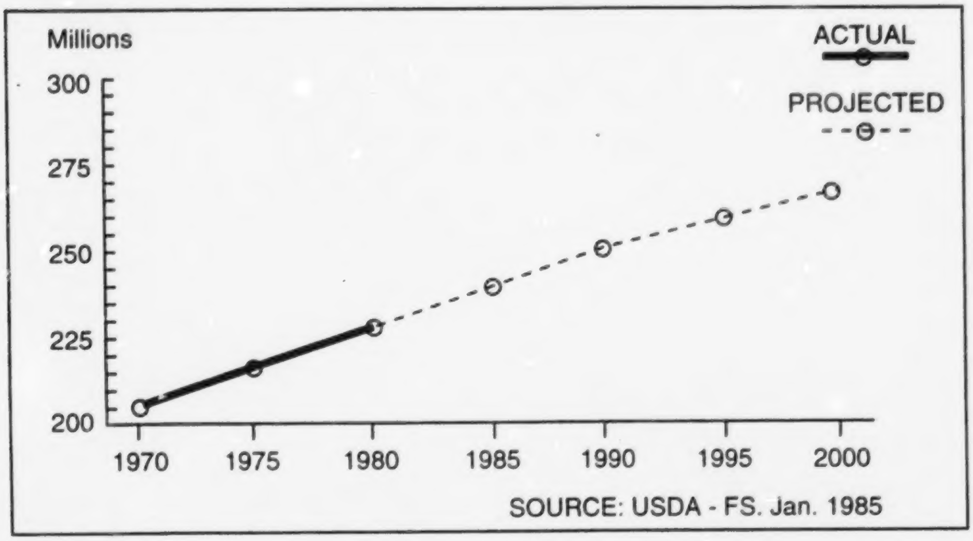
Directions: Using the graphs on the following pages (Tables 1-5), answer these questions.

1. What will the population of the United States be in 1995? ______________
2. What will the population of the United States be in the year 2000? ______________
3. What will the population growth be between 1990 and 2000? ______________
4. Considering that 90% of people participate in outdoor recreation, how many more people will participate in 2000 vs 1990? ______________
5. What was the percent participation of family members in 1985? ______________
6. What was the percentage of people age 12-19 who visited federal and state parks in 1985?

   ____
7. What percentage of people over 60 visit federal and state recreational areas? ______________
8. What was the percentage of disabled visitors to public recreation areas in the United States in 1985? ______________
9. What was the fastest growing recreational activity in the United States between 1960 and 1982? ______________
10. What was the percentage of increase in the recreational activity in question 9? ______________

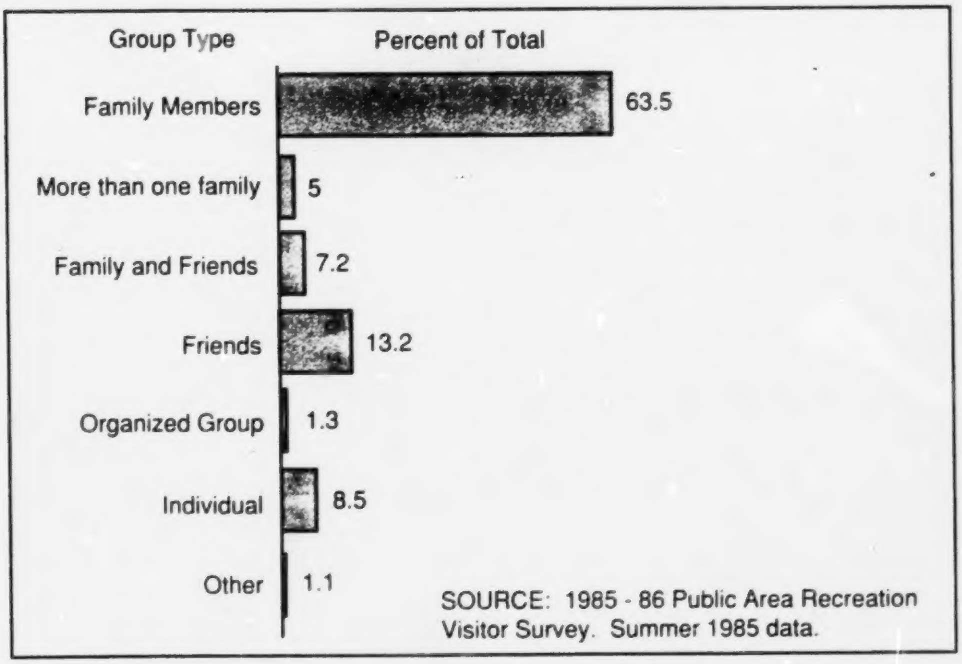
Assignment Sheet 3

Table 1—U.S. population from 1970 to 1980 with projections to 2000



SOURCE: USDA - FS. Jan. 1985

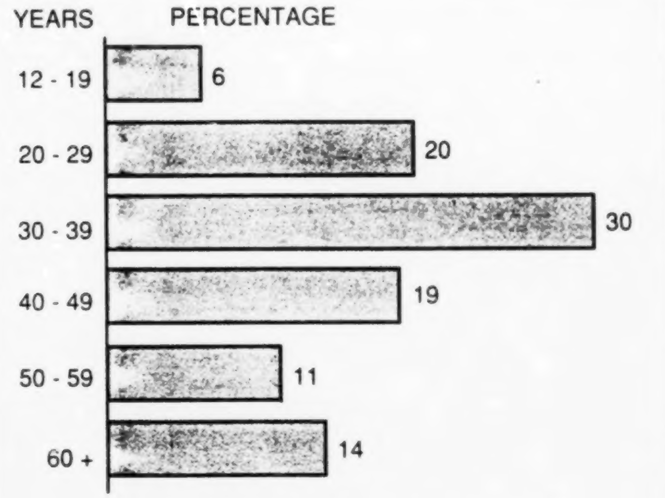
Table 2—Group composition of visitors to public recreation areas in the U.S., 1985



SOURCE: 1985 - 86 Public Area Recreation Visitor Survey. Summer 1985 data.

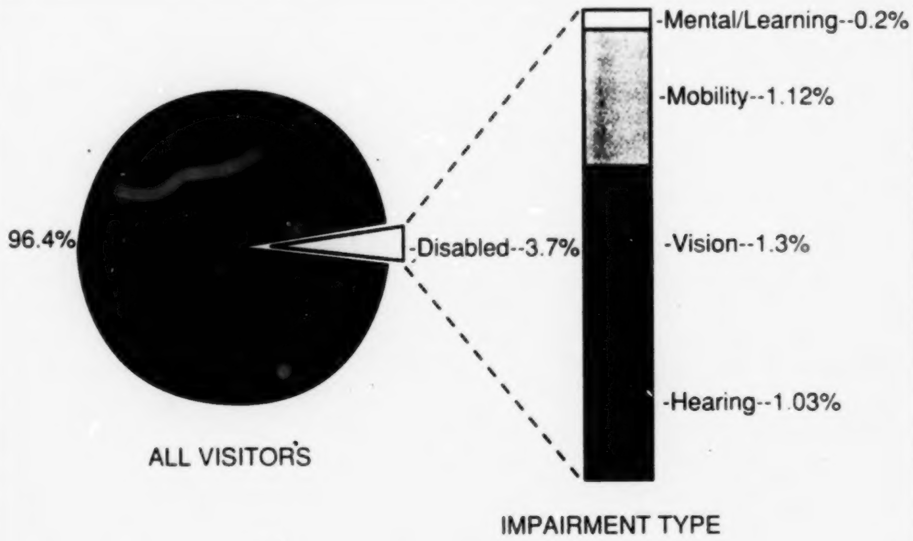
Assignment Sheet 3

Table 3—Profile of visitors to federal and state areas in the U.S., summer 1985, according to age (only persons 12 +)



SOURCE: Public Area Recreation Visitor Survey
Summer 1985 data.

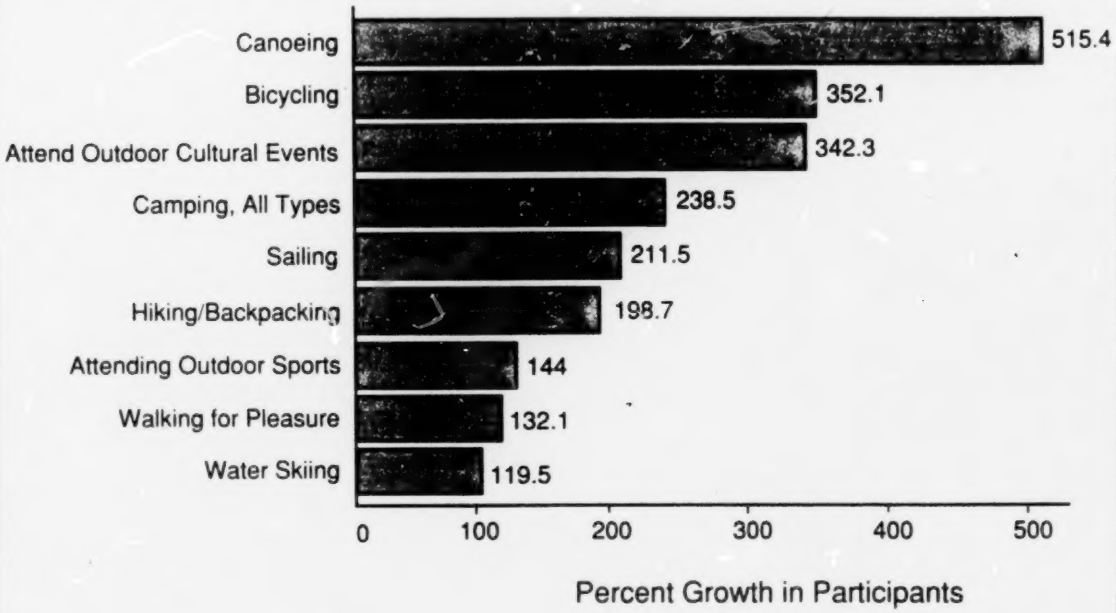
Table 4—Physically challenged visitors to public recreation areas in the U.S., 1985



SOURCE: Public Area Recreation Visitor Survey.
Summer 1985 data.

Assignment Sheet 3

Table 5—Percentage changes in number of summer participants in nine rapidly growing activities, 1960-1982



SOURCE: 1960, 1982-83 National Recreation Survey.

Outdoor Recreation
Unit 10

Assignment Sheet 4—Evaluate a Local Outdoor Recreation Site

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
• Directions have been followed	______
• Evaluation is accurate	______
• Recommendations indicate cognitive grasp of subject	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: Parks and recreational areas abound throughout the United States. Some are more successful than others at meeting public demand for "quality time" outdoors. In this exercise you will be asked to visit a park or recreational area to survey its various offerings and how they might serve the individuals who frequent the area.

Directions: Visit a local park or recreational site. Survey the area and its facilities. Rate the site according to the following criteria. Then make recommendations on ways to improve the site.

	Excellent	Acceptable	Unacceptable	Not present
Natural beauty				
Amount of crowding				
Sanitation facilities				
Parking availability				
Available information				
Picnic areas				
Cultural events				
User fees				
Concessions				
Organized sports				
Guided activities				
Physically challenged access				
Others (list as needed)				

Assignment Sheet 4

Recommendations for improvement of site:

1. ______________________________
____

2. ______________________________
____

3. ______________________________
____

4. ______________________________
____

5. ______________________________
____

Outdoor Recreation
Unit 10

Assignment Sheet 5—Plan and Design a New Outdoor Recreation Area

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
• Plan shows imagination and includes practical and useful ideas	______
• Area designed for maximum comfort, convenience, and enjoyment, and includes accessibility for physically challenged	______
• Drawings or pictures clearly represent design features	______
• Summary is informative and clearly describes plan	______
• Assignment was completed on time	______

Introduction: Trends in outdoor recreation reflect an interest by approximately 90% of the public in some type of activity. Each year millions of people visit national, state, and/or local parks. As you learned in Objective 6, there are several considerations when selecting an outdoor recreation site. These considerations also apply when you are planning and designing a new outdoor recreation facility.

In this assignment you will have the opportunity to be creative by designing what you think would be an ideal camping facility in a park.

Directions: Consider yourself a park manager. You are developing a new area for camping. It is your responsibility to plan and design the area for maximum comfort, convenience, and enjoyment.

Review the information sheet to determine the facilities and equipment needed for camping. Analyze what people want in a camping area, and why they enjoy camping. Also, consider features that will make your area accessible for the physically challenged. Most of all, use your imagination.

Draw or find pictures to show your design, and write a brief summary of your plan. Mount the pictures and summary on a poster board for display. Be prepared to present your plan and design in class.

Outdoor Recreation
Unit 10

Assignment Sheet 6—Research Local Employment Opportunities in Outdoor Recreation

Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
• Information presented is accurate	______
• Assignment is neat and legible	______
• Assignment was completed on time	______

Introduction: As part of the study of outdoor recreation, one should have some idea of the employment opportunities available in a given area. Completing this exercise will give you some idea of the jobs and opportunities available in your local area which are derived from outdoor recreation.

Directions: Make a list of local government agencies, organizations, or businesses that employ people in outdoor recreation. Include the local telephone number and business address.

Potential Employer	Address	Phone #

Introduction to Natural Resources

Glossary

Accident—Any suddenly occurring, unintentional event that causes injury or property damage

Air—A mixture of invisbile, odorless, tasteless gases that surround the earth

Air pollution episode—Abnormally high concentrations of air pollutants

Algae—Simple, free-floating water plants

Ambient air—Any unconfined portion of the atmosphere; the outside air

Anesthetic—A substance that causes loss of the sense of pain or itching

Antiseptic—A substance that prevents infection by killing bacteria

Aquatic—Growing or living in or upon water

Aquifer—Sand, gravel, or rock formation found below the earth's surface which is saturated with water

Atmosphere—The mass of air surrounding the earth held by the force of gravity

Bacteria—Microscopic, single-celled plants active in consuming wastes and building topsoil

Bag limit—The legal number of game animals that can be taken

Barrel (bbl)—A measure of volume of petroleum products; equal to 42 U.S. gallons

Biodegradable—A material that decomposes in the environment as a result of the activity of microorganisms

Biomass—The amount of living matter (plants and animals) in a given habitat

Bole—The stem or trunk of a tree

Branches—Larger, outgrowing stems from the trunk

Broadleaf—Trees that have wide, flat leaves

Browse—The leaves, shoots, and twigs of trees and shrubs available for animal consumption

Buds—Small, growing projections at the ends or sides of stems that may develop into a flower, leaf, or shoot (new twig)

Buffer strip— An area that divides two areas of differing habitat

Canopy—Leaf area of the woodland

Cardiac arrest—Stoppage of the involuntary beating of the heart

Cardiopulmonary resuscitation (CPR)—Procedure for restoring normal breathing after cardiac arrest

Carelessness—Failure to think before one acts; failure to pay attention

Carnivores—Animals that eat meat (other animals)

Carrying capacity—The maximum number of animals that an area can support

Chlorophyll—Green photosynthetic coloring matter in plants

Combustion—The chemical process of burning which releases heat, light, and chemical by-products

Commercial forests—Land capable of producing an economically useful forest

Compaction—Pressing soil particles closer together which leaves less pore spaces available for air or water in the soil

Concessions—The right to sell food, supplies, or equipment at a park or event

Conifer—Trees that bear seeds in cones and that have long, narrow, (needle-like) leaves

Contour—An imaginary line along the ground connecting all points of the same elevation

Convenience—Something that makes work easier

Cover—Vegetation or other material providing protection to an animal

Crown—The foliage and flowering/fruiting part of the tree

Cultural event—Events or programs which train and refine the mind

Deciduous—Plants that shed all of their leaves at the end of the growing season and remain leafless during the dormant (non-growing) season

Defoliation—Loss of leaves, especially prematurely

Degradation—Lowering quality of a resource

Demand—The desire for something, together with the ability to pay for it

Dendrology—The study of trees

Depletion—Using up the total quantity of a resource

Disposable personal income (DPI)—Income above what is needed to buy life's necessities

Glossary

Ecologist—One who studies the relationship between organisms and their environment

Ecosystem—A unit of the environment comprising the interaction of all organisms and the physical components within a given geographic area

Edge—The transitional zone where one cover type ends and another begins

Emission—Pollutant discharged into the air

Endangered species—Species that is in danger of becoming extinct through all or part of its range

Energy—The capacity to produce motion, heat, or light

Energy conservation—Planned management of energy resources which conserves, protects, and prevents waste

Energy reserves—Energy resources which have not been used

Energy resources—A measure of national wealth by the production of usable power such as heat and electricity

Environmental impact—Changes in the environment caused by some form of management

Erosion—The wearing away of land surface

Evergreen—Plants that retain their green foliage (leaves) throughout the year

Exotic—Species not native to an area

Extinct species—Species that no longer exists

Facility—A structure or convenience which allows something to be done more easily or enjoyably

Fertilizer—An organic or inorganic material that is added to the soil to supply elements essential to plant growth

First aid—Immediate temporary care given the victim of an accident or sudden illness or trauma until the services of a physician can be obtained

First-degree burn—Burn affecting only the outer skin layers; characterized by redness and pain

Flood hazard—Refers to the likelihood that an area will receive flood damage

Flowers—The reproductive part of a seed-bearing plant

Food chain—An arrangement of predator-prey relationship in an ecosystem

Food plot—Area planted to maintain wildlife food supply

Food web—The interconnected food chains within an ecosystem

Forage—All browse and non-woody food that is available to livestock or game animals

Forb—A general name for any fleshy-leafed plant, other than grass, which is found in grasslands and open woodlands

Forest—A complex community of associated trees, shrubs, other plants, and animals

Forestry—The art and science of managing forests so as to yield, on a continuous basis, a maximum in quality and quantity of forest lands to satisfy human needs

Fossil fuels—Hydrocarbon compounds derived from the remains of organisms buried millions of years ago

Frostbite—Tissue damage due to freezing of tissue fluids

Fruit—The edible, more or less soft product of a plant, consisting of ripened seeds and adjacent tissues or tissue only (seedless)

Game animal—Animal hunted by humans for its fur, flesh, or trophy value

Global—Involving the world

Grounded—Electrical connection to an object that conducts electrical current to the earth

Ground water—Water found below the earth's surface

Ground water recharge—Water which seeps through the earth's surface and into ground water aquifers

Habitat—The area where a plant or animal naturally lives and grows

Hazard—Potential source of danger

Hazardous material—Any cancer-causing, corrosive, toxic, irritant, oxidizer, or other material that has the potential to damage specific body organs

Hazardous/toxic waste—Waste that poses a serious threat to human health, even at low concentrations

Hazardous waste site—A location where hazardous waste poses a potential threat to the environment

Heat cramps—Muscular pains and spasms due to loss of salt through sweating

Heat exhaustion—Fatigue, weakness, and sometimes collapse due to loss of body fluids through sweating and lack of adequate water intake

Heat stroke—Immediate, life-threatening emergency in which the victim has extremely high body temperature and a failure of the sweating mechanism

Glossary

Heavy metals—Metallic elements with high molecular weights; generally toxic to plant and animal life

Heimlich maneuver—Procedure for forcing a foreign object from the windpipe of a choking victim

Herbivores—Animals that eat plants

Home range—The area in which an animal lives and travels

Humus—Highly decomposed plant and animal residue that is a part of soil

Hydrologic cycle—Continuous circulation of water between the oceans, atmosphere, and the earth's surface

Hypothermia—Below normal body temperature usually due to overexposure to low temperatures

Igneous—Formed by hardening of molten volcanic materials

Industrial waste—Waste generated by industries

Inert material—A clay material used as a filler in fertilizer applications

Inversion—An atmospheric condition where a layer of cool air is trapped by an upper layer of warm air

Land capability class—The suitability of land for a specific use without permanent damage

Land management—The planning and implementation of practices applied to the land

Land use planning—A political process to determine the uses of a given land

Leaves—Single unit of foliage that functions primarily in food manufacture through photosynthesis

Leisure—Unoccupied time during which one may indulge in rest or recreation

Life expectancy—The average age at which people die

Limiting factors—Factors that restrict the population potential of a species

Liquified petroleum gas (LPG)—A mixture of heavier gases, principally butane and propane, that are easily liquified at moderate pressure to make them easier to transport; are converted back to gases when pressure is released

Loam—A soil material that contains relatively equal amounts of sand, silt, and clay particles

Mast—Nuts of trees and shrubs (such as oak, hickory, and beech) which are used as food by animals

Material safety data sheet (MSDS)—Form that lists and explains each of the hazardous materials that an employee works with so the employee can safely use the material and respond to emergency situations

Metamorphic—Formed as a result of changes in other rocks under heat and pressure

Migrate—To move from one region or climate to another for feeding or breeding

Mineral—A naturally-occurring inorganic substance in the soil

Motivation—An inner drive (need or desire) that causes one to act in a certain way

Mulch—A layer of plant residue on the soil surface

Municipal waste—Waste from cities, primarily sewage

National ambient air quality standards (NAAQS)—The level of pollutants in the outside air that by law cannot be exceeded during a specified time in a specified geographical area

Natural resources—Land, water, air, wildlife, sunlight, and human labor

Nocturnal—Active at night

Nonpoint source pollution—Pollution which enters the environment from a wide area

Nonrenewable natural resources—Resources which cannot be replaced in a lifetime after they are used

Nutrients—Mineral elements and compounds (including water and air) which a plant uses for tissue growth and maintenance

Oil embargo—An order by a government to prohibit oil shipments from its ports, generally prohibiting shipment to specific countries

Omnivores—Animals that eat both animals and plants

Organic compounds—Compounds composed of chemicals containing carbon

Organic material—Plant and animal matter in various stages of decay

Ozone (03) layer—Layer of the atmosphere that protects the earth from ultraviolet radiation in sunlight

Parent material—The earth materials from which soil is formed

Percolation—The downward movement of water into the soil

Permeability—The ability of the soil to allow air and water to move through it

Pesticide—A chemical used to kill or control pests

Glossary

Petroleum—A natural, thick, yellow-to-black, flammable liquid hydrocarbon mixture found principally beneath the earth's surface

pH—A scale which represents alkalinity or acidity

Photosynthesis—The process of producing carbohydrates from water, carbon dioxide, chlorophyll, and light

Plankton—Suspended, floating, microscopic plants and animals in the water

Plant nutrients—Elements essential for plant growth

Point source pollution—Pollution which can be traced to a point of discharge

Pollutant—Any introduced gas, liquid, or solid that makes a resource unfit for a specific purpose

Pollution—A reduction in the quality of the environment by the introduction of impurities

Population density—The number of animals in a defined area

Predators—Animals that hunt, kill, and consume other animals

Prey—An animal taken as food by a predator

Protected species—A species whose life, habits, and habitat are protected by law

Raptor—A bird of prey

Reclamation—Transforming barren areas as nearly as possible to their original condition after surface disturbance

Recreation—Activity that refreshes or restores a person's strength and spirit after work

Recycle—To reuse or process waste for beneficial purposes

Recycling—Transforming waste products into new products

Refuge, reserve, or wilderness area—An area of land set aside for the protection of wildlife

Release cut—Thinning of old shrub growth to allow new growth

Renewable energy—Resources that can be replaced by natural regeneration of human efforts after they are used

Respiratory system—Organs such as the throat, lungs, and air channels which supply oxygen to air-breathing vertebrates

Rest—Free from work or activity

Riffles—A shallow area in a stream that causes broken water

Riparian land—The area along the bank of a natural watercourse

Roots—The underground part of a tree that extracts nutrients from the soil and atmosphere

Safety—State or condition of being safe; freedom from danger, risk, or injury

Sap—The liquid that circulates through the tissue of woody plants

Scenic—View or landscape having natural beauty

Scrubber—An air pollution control device that uses a liquid spray to remove pollutants from a gas stream (as in a smoke stack); also lowers the temperature of the emission

Season—Time set aside for legal hunting or fishing

Second-degree burn—Burn penetrating beneath the superficial skin layers; characterized by swelling and blisters

Sedimentary—Formed by a consolidation of particles laid down over the years

Seeds—The small bodies produced by flowering plants which are capable of developing by germination (sprouting)

Septic system—A waste treatment system used primarily in rural areas or where city sewer lines do not exist

Shock—A medical condition in which the operation of the circulatory system is partially or completely impaired by the body's reaction to injury or psychic disturbance

Silviculture—The art of producing and caring for a forest

Slope—The angle of the soil surface expressed as a percent of rise and fall

Soil—The outer portion of the earth's crust that supports plant life

Soil auger—A tool used to bore into the soil and withdraw a soil sample

Soil horizon—A layer of soil materials

Soil map—A map showing the distribution of soil types

Soil profile—Vertical section of a soil horizon

Soil survey—The systematic examination, description, classification, and mapping of soils in an area

Soil type—A soil series based on surface texture

Spawning—The process by which fish deposit eggs

Glossary

Species—A group of organisms that resemble each other closely and that interbreed freely

Stagnation—Lack of wind in an air mass

Statistics—Facts of a numerical kind

Stress—Tension, strain, or force exerted upon a body

Succession—The progressive development of vegetation which replaces one plant community with another in order to reach a climax condition

Surface water—Water visible on the earth's surface

Surplus—Amount over and above what is needed

Terrain—Tract of ground, especially in regard to its features or fitness for some use

Territory—The area an animal will defend

Texture—The fineness or coarseness (size) of soil particles

Third-degree burn—Burn that destroys all skin layers and underlying tissue; characterized by charring or white, leathery appearance of the skin and lack of pain

Topical—On the skin

Topography—The study of physical features (natural and man-made) on the land's surface

Tourism—Industry of attracting tourists to a given location

Transpiration—The release of water vapor by the leaves into the air

Tree—A single-stemmed woody plant usually over 20 feet high at maturity

Trend—The general tendency of a course of events

Trunk—The main stem of the tree that transports nutrients

Turbidity—Cloudy appearance of water due to suspended sediment particles

Twigs—Smaller stems from the branches

Unique—One of a kind or distinctive

Upland—The higher parts of a region, away from major rivers and streams

Urbanization—Growth or expansion of cities

Waste—Useless, unwanted, or discarded material

Water pollution—Water which is made chemically, biologically, or physically impure or unfit for use

Watershed—The total drainage area where water flows to a common point

Water vapor—Water which has evaporated and is suspended in the air

Weathering—The actions that break down rock into soil, i.e., freezing/thawing; wind and water erosion; glaciation

Wetlands—Areas that stand in water a significant portion of time, especially as areas used by wildlife

Wildlife—Mammals, birds, and fish not domesticated

Wildlife biology—The study of wildlife and its interaction with an ecosystem

Wildlife management—The scientifically-based activity of making land produce sustained annual crops of wild game

Windbreak—A living barrier of trees and shrubs designed for protection from wind and/or snow

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